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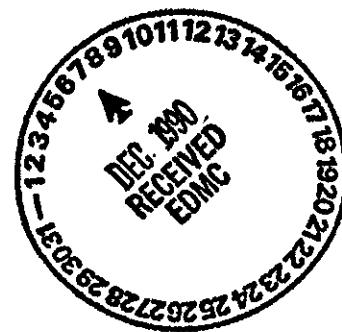
SST
WASTE CHARACTERIZATION PROJECT

CORE 3 DATA REPORT

Revision 1

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September 7, 1990



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Introduction

This Data Package contains results obtained by Pacific Northwest Laboratory (PNL) staff in the characterization and analyses of Core 3 segments taken from the single-shell tank 110-B. The characterization and analysis of Core 3 segments are outlined in the Waste Characterization Plan for Hanford Site Single-Shell Tanks (SST) and in the Pacific Northwest Laboratory (PNL) Single-Shell Tank Waste Characterization Support FY 89/90 Statement of Work, Rev. 0 (SOW) dated September, 1989. Specific analyses for each sub-sample taken from a segment are delineated in Test Instructions prepared by the PNL Single-Shell Tank Waste Characterization Project Management Office (SST Project) in accordance with procedures contained in the SST Waste Characterization Procedure Compendium (PNL-MA-599). Analytical procedures used in the characterization activities are also included in PNL-MA-599.

Core 3 consisted of five segments. Each segment was contained in a sampler and was enclosed in a shipping cask. The shipping cask was butted up to the 325-A hot cell and the sampler moved into the hot cell. The material in the sampler (i.e., the segment) was extruded from the sampler, physical characteristics assessed, and photographed. At this point samples were taken for particle size and volatile organic analyses. Each segment was then homogenized. Sub-samples were taken for required analyses as delineated in the appropriate Test Instruction.

A complete segment was expected to be ~ 19 inches in length and to contain ~ 250 grams of material. The segment 1 sampler contained no material. The other four Core 1 samplers contained the expected amount of material.

Requested analyses for Core 3 homogenized segments included: Weight-% Solids; inductively-coupled plasma atomic emission spectroscopy (ICP) analysis, gamma energy analysis (GEA), total alpha, total beta, and uranium analysis, in duplicate, from samples that has been fused with potassium hydroxide (KOH); ICP on duplicate samples from an acid leach as per EPA protocols; and anion analysis, total organic carbon, and pH from a water leach procedure. Analyses requested for the Core Composite included all of

the analyses outlined above plus an extensive array of radiochemical, inorganic, and semivolatile organic analyses.

The data within this package are divided into three groups: physical testing, inorganic analysis, and radiochemical analysis. No organic analysis data are included in the Data Package at this time due to instrument difficulties. Organic analysis data will be provided when available. Specific data within a group are separated by analytical methodology used in individual segment or the Core Composite analysis. Table 1 provides the correlation between PNL laboratory numbers and requested analyses. All chemical analysis data are reported on a per wet-weight basis. That is, no corrections were made for the weight percent water in the samples. All sample preparations were completed in duplicate, thus, duplicate analysis data are available for essentially all samples. The quality control (QC) requirements for each sample are defined in specific test instructions. To the extent practical, the sample-specific QC requirements outlined in EPA documents such as SW-846 and the CLP-SOW were followed. All sample-specific QC data are included in this data package.

All chemical analysis data are available on Lotus/Excel- compatible diskette files.

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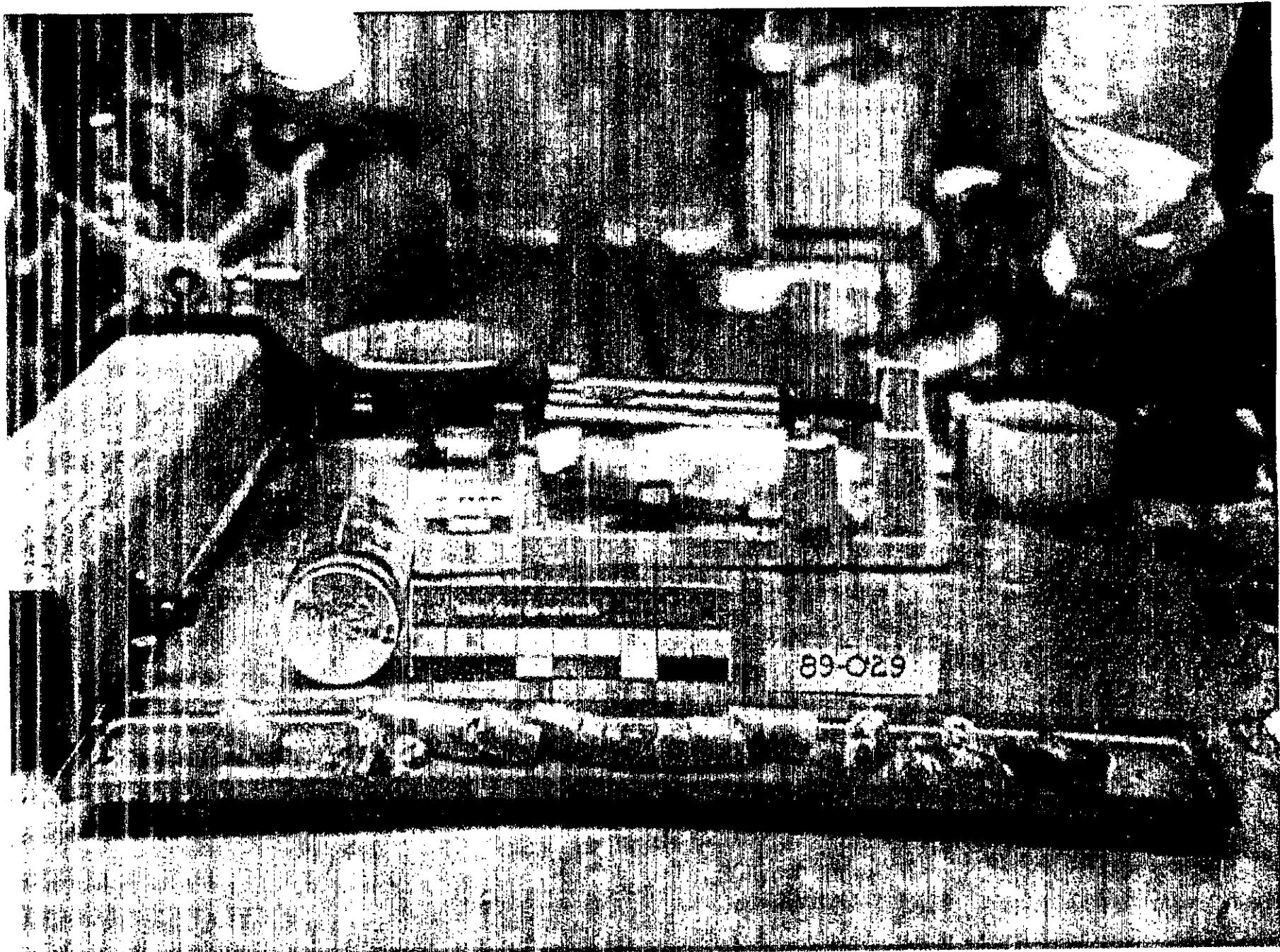
TABLE 1. Core 3 Sample Numbers

<u>Prehomogenized Segment</u>	<u>Homogenization Test</u>	<u>Homogenization Analyses</u>	<u>Composite Test</u>	<u>Composite Analyses</u>
<u>Segment 2</u>				
	89-0449			
	89-0453			
<u>Segment 3</u>				
	89-0450	89-0668	89-1107	
	89-0454	89-0669		
<u>Segment 4</u>				
	89-0451			
	89-0455			
<u>Segment 5</u>				
	89-0452		89-1109	
	89-0456			
<u>Composite</u>				
			89-0971	89-0977
			89-0972	
			89-0973	
			89-0974	
			89-0975	
			89-0976	

PHYSICAL DATA TABLES

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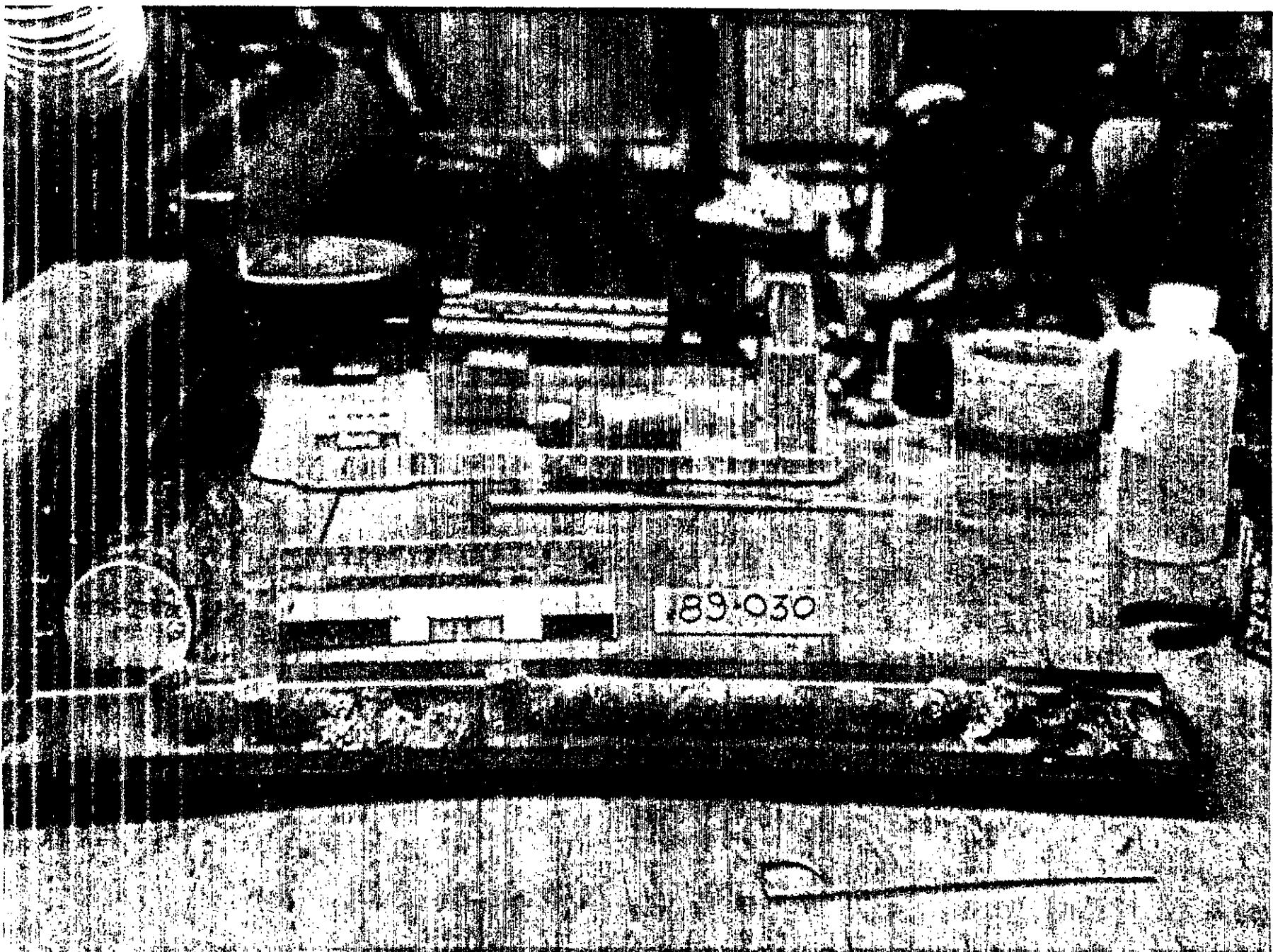
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Core 3, Segment 2

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L



Core 3, Segment 3

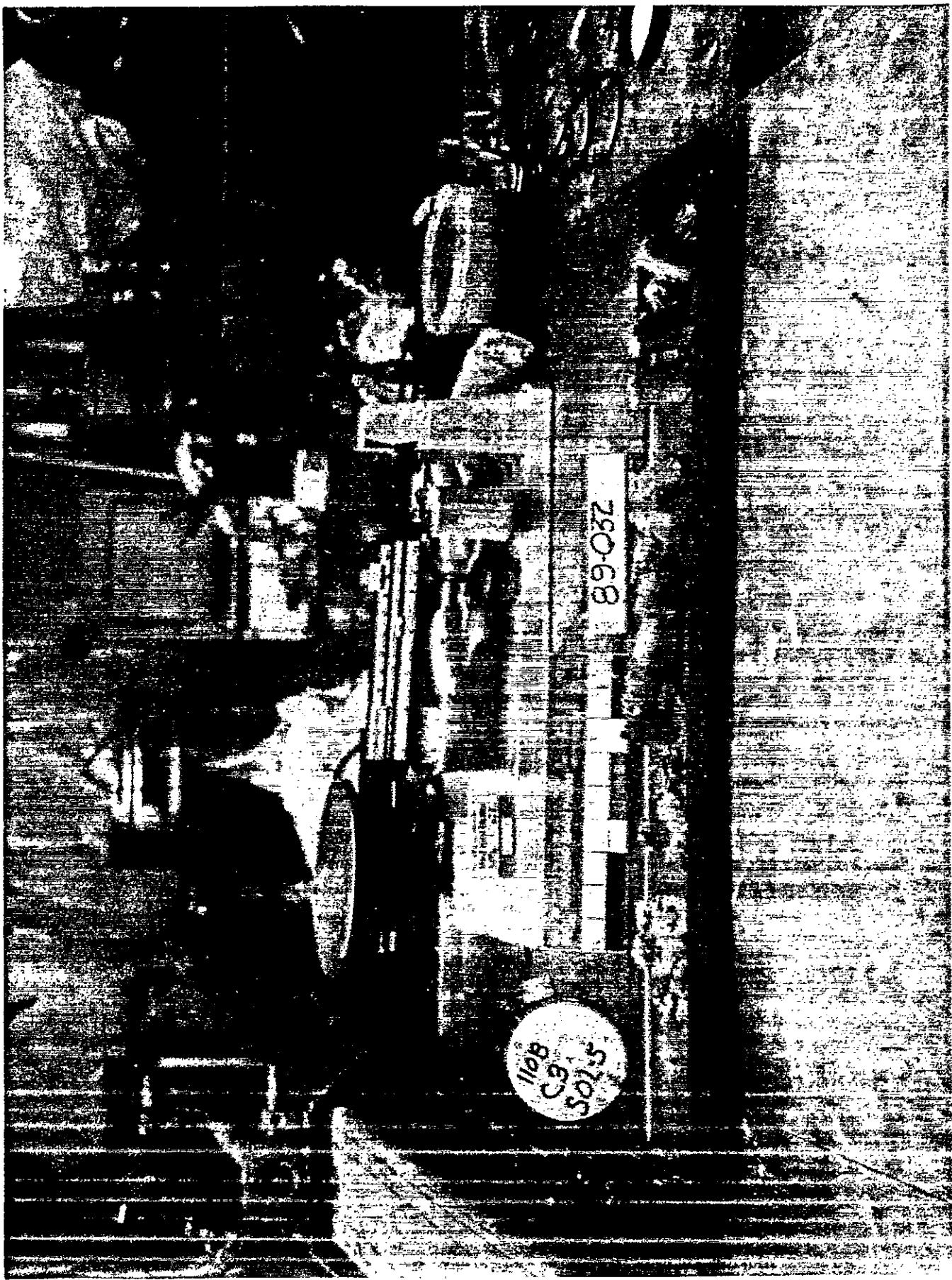
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Core 3, Segment 4

Core 3, Segment 5



9 1 1 2 1 3 5 0 0 1 4

DESCRIPTION OF EXTRUDED SEGMENTS

Five Core 3 samplers from Tank 110B, Riser 5 were received and extruded. The mass, volume, density, and penetration resistance for each of the segments extruded are given in Table 2. The first sampler was completely empty; therefore, no data exists for Core 3, Segment 1. Also, no drainable liquids nor prehomogenized slurries were obtained from this core; therefore, no data on drainable liquids or prehomogenized slurries for Core 3 exists. The penetration resistance of the prehomogenized segments was < 2 psi for all the segments; therefore, the entire core can be considered cohesive. The bulk densities of the segments were all 1.3 g/ml. Photographs of each extruded segment are found on pages 6 to 9.

As can be seen in these photographs, all of the segments were sludges with varying colors and amounts of interstitial liquid. The top two to three inches of Segment 2 were dark chocolate brown in color. The remainder of this segment was light tan in color except the bottom three inches where the center of the segment was dark chocolate brown and the outer surface was tan. None of the sample flowed.

The top three inches of Segment 3 are dark chocolate brown in color with more interstitial liquid than the remainder of the segment. About 5 inches from the bottom of the segment there is a 2 inch portion of the sample which is light gray in color, and the remainder of the segment is brownish tan in color. This segment appears to contain more interstitial liquid than Segment 2.

The top three inches of Segment 4 contained enough liquid that this portion of the segment did not hold its shape. During the extrusion of this portion of the segment, a small amount of liquid (< 2 ml) could be seen on the extrusion pan. The remainder of the segment held its shape. The color of the segment gradually changed over the length of the segment from grayish tan at the top to dark tan at the bottom.

Approximately the bottom seven inches of Segment 5 contained enough liquid that this portion of the segment did not hold its shape. The remainder of the segment (top 12 inches) was dry and were extruded in inch long pieces. This segment was grayish tan to tan in color.

TABLE 2: Core 3 Prehomogenized Segment Data

<u>Segment</u>	<u>Mass (g)</u>	<u>Volume (ml)</u>	<u>Density (g/ml)</u>	<u>Penetration Resistance (psi)</u>
1	0	0	N/A	N/A
2	318.59	250	1.3	< 2
3	320.12	250	1.3	< 2
4	319.72	250	1.3	< 2
5	306.73	250	1.3	< 2

Physical Properties

Table 3 lists the physical data for the Core 3 composite material. Duplicate runs were conducted for each measurement made in determining the properties described in this table. Only one value is listed for wt% undissolved solids since this value is determined from difference between the wt% total solids and the wt% dissolved solids. Analyses were completed following procedure WHC-053-1.

TABLE 3: SST Core 3 Composite Physical Data

1) Bulk Density	7) Wt% Dissolved Solids
1.339 g/ml 1.346 g/ml	12.49% 14.23%
AVE = 1.360 g/ml	AVE = 13.36%
2) Centrifuged Solids Density	8) Wt% Undissolved Solids
1.578 g/ml 1.564 g/ml	26.3%
AVE = 1.57 g/ml	Calculated from wt% total and wt% dissolved solids.
3) Centrifuged Supernate Density	
1.239 g/ml 1.244 g/ml	
AVE = 1.242 g/ml	
4) Wt% Centrifuged Solids	
44.87% 44.70%	
AVE = 44.79%	
5) Vol% Centrifuged Solids	
37.82% 38.33%	
AVE = 38.08%	
6) Wt% Total Solids	
41.56% 37.70%	
AVE = 39.63%	

Rheological Characterization

The rheological characterizations (shear stress versus shear rate) were measured on the homogenized 110-B core 3 composite. The data obtained from the rheological characterizations is important for retrieval operation and is used to evaluate the viscosity of a fluid and to assess the ability to transport the waste in pipes. The data are generated in the form of a rheogram or flow curve, which is a plot of shear stress as a function of shear rate.

The rheograms were obtained using a Haake RV 100 viscometer equipped with an M5 measuring-drive head and the MV1 sensor system. The measurement of viscosity with this instrument requires that the sample be placed in the gap between two coaxial cylinders. About 40 mL of sample is agitated and transferred into the cylinders.

When the Haake system is set in motion, a viscosity-related torque, caused by the sample's resistance to shearing, acts on the inner cylinder. This torque deflects a calibrated measuring spring placed between the motor and the inner cylinder. The magnitude of the spring deflection correlates linearly with the torque. The spring deflection is transformed into an electrical signal. The spring deflection and tachometer signals are recorded. This data is used to calculate the shear stress versus shear rate.

A slurry with a yield stress will "clamp" the rotor to the cup until the applied torque exceeds the yield stress. While the rotor is still "clamped" and remains motionless, the motor rotation will cause some spring deflection and consequently a torque signal which is recorded. When sufficient force is transmitted to the material to break the gel or make it yield, the rheogram will angle sharply to the right, and from then on the behavior of the material as a fluid will be recorded. This sharp angle that is recorded as the material becomes fluid is the yield point. The height of this peak measured in Pascals on the ordinate is the value of the yield stress.

Two rheograms were obtained for the sample of the homogenized core 3 composite. The measurements were obtained at the cell temperature of 32°C. The viscosity changed with shear rate as shown in Figure 1, and therefore, the waste is classified as a non-Newtonian fluid. The homogenized core 3

composite had a density of 1.34 g/mL, contained 40 wt% total undissolved solids and 38 vol% centrifuged solids. The sample of waste was thoroughly agitated prior to obtaining the first rheogram. The sample was not agitated prior to the second measurement. Settling of the solids in the cylinders may occur between measurements. The homogenized core 3 composite settled very slowly and therefore, the effect of not agitating in between measurements did not appear to be significant for this particular waste based on results presented in Figure 1. However, in future characterizations, the sample will be agitated prior to each measurement to assure that the second rheogram is obtained under the same conditions as the first rheogram.

The homogenized 110-B core 3 composite exhibited a yield stress, and therefore, the data from the rheogram were "fit" to a yield-pseudoplastic model. The rheological models for this waste were:

$$\begin{aligned}\tau &= 2.58 + 0.0436(\gamma)^{.8619} & r^2 &= 0.987 \\ \tau &= 2.90 + 0.01505(\gamma)^{1.0266} & r^2 &= 0.966\end{aligned}\quad (3)$$

where τ = shear stress, Pa

γ = shear rate, sec⁻¹.

r^2 = correlation coefficient

Figure 1 shows the viscosity versus shear rate for the homogenized core 3 composite. A shear rate of 250 sec⁻¹ corresponds to a velocity of 8 ft/sec in a 3-in.-diameter pipe. The viscosity of this waste decreases with increasing velocity (ie. shear rate).

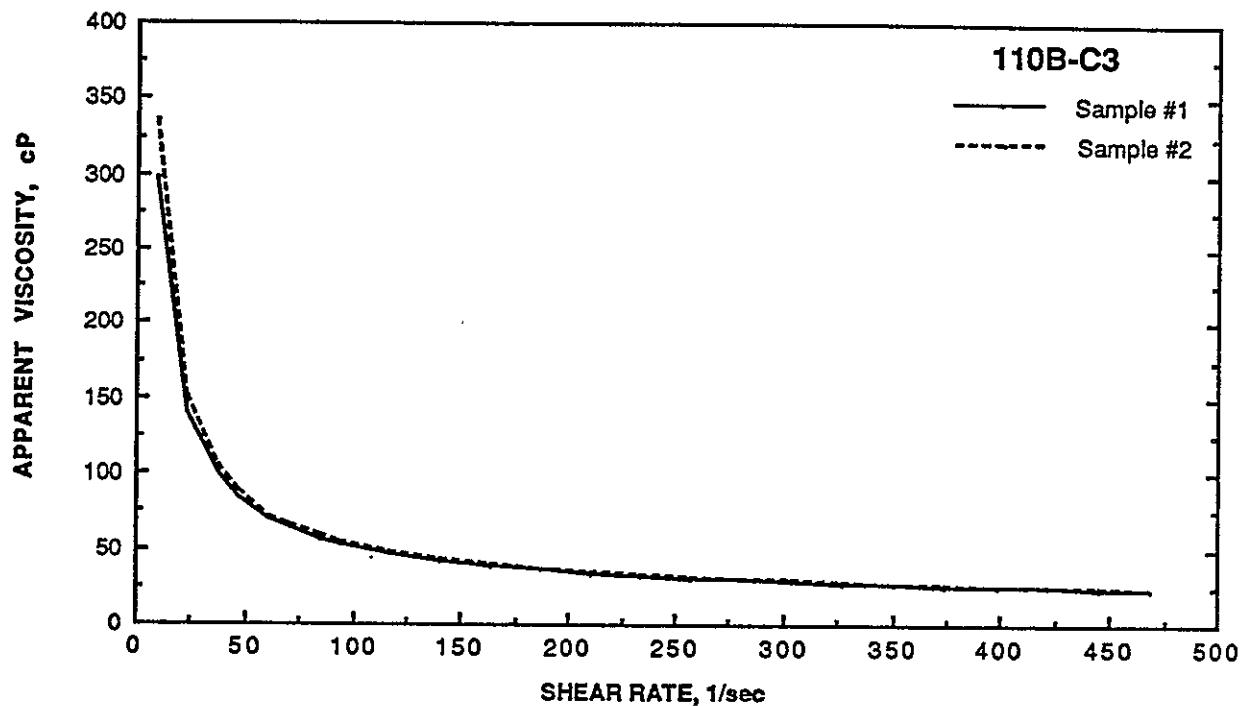


FIGURE 1. Viscosity of the Homogenized 110-B Core #3 Composite

The rheological parameters, together with the density, were input into the Hanks' computer model (Hanks 1978) to obtain the critical Reynolds number, critical velocity, friction factor and pressure drop for transporting the slurries in 4.0-in., 3.0-in. and 2.0-in.-diameter pipes. For a 4.0-in.-diameter pipe, the critical Reynolds number ranged from 5600 to 7300 and the critical velocity for both rheological models was 3.3 ft/sec (132 gpm). For a 3.0-in.-diameter pipe, the critical Reynolds number ranged from 4900 to 6000 and the critical velocity for both models was 3.6 ft/s (83 gpm). For a 2.0-in.-diameter pipe, the critical Reynolds number ranged from 4000 to 4600, and the critical velocity was 4.1 ft/sec (43 gpm).

The rheological characterizations were performed under PNL Quality Assurance Manual MA-70, Impact Level II requirements. The Hanks' computer model is a purchased computer program but has not been verified internally by PNL. Therefore, the computer model is being used in accordance with MA-70, Impact Level III requirements.

Thermal Analysis Results

Thermogravimetry and differential scanning calorimetry were performed in duplicate on the homogenized Core 3 composite. Differential Scanning Calorimetry (DSC) and Scanning Thermogravimetry (STG) are two thermal analysis techniques that are useful for determining the thermal stability or reactivity of a material.

DSC measures heat released or absorbed while the temperature of the sample is increased at a constant rate. STG measures the mass of a sample while the temperature of the sample is increased at a constant rate. Both methods can be modified to measure isothermal changes in the material. DSC is often used to measure thermal decomposition temperatures, heats of reaction, reaction temperatures, melting points, and solid-solid transition temperatures. STG is used to measure thermal decomposition temperatures, water contents, and reaction temperatures. The two methods often provide complimentary information.

The calibration of the differential scanning calorimeter and the thermogravimetric analyzer were checked before running these samples. An indium standard was run on the calorimeter to check the temperature and enthalpy calibrations. The balance calibration of the thermogravimetric analyzer was checked with a 100 mg standard weight, and the temperature calibration of the analyzer was checked with alumel/perkalloy, alumel, and perkalloy curie point magnetic transition standards.

Figures 2 and 3 are the DSC plots for the core composite runs 1 and 2, respectively. The core composite material exhibits three major transitions. The first two transitions have peak maximums around 78 and 110°C, indicating that two types of water are present in the core material. Because these first two transitions are unresolved broad peaks, other transitions may also exist in this temperature range but are obscured by these two larger peaks. A third transition is observed at approximately 295°C. This third transition is small relative to the previous transitions and is most likely due to a solid/liquid transition of nitrate and nitrite salts. Further studies are being performed to determine if this assumption is correct.

The temperature range, temperature of the peak maximum, onset temperature, and enthalpy change for each transition are given in Table 4. The enthalpy change for transitions 1 and 2 cannot accurately be determined because these transitions are unresolvable.

Figures 4 and 5 are STG curves for the core composite material. A wt% total solids of 45% for this material was obtained from these two curves. The thermogravimetric measurements confirm that at least two types of water exist. At the heating rates at which these curves were recorded, the two water loss steps cannot be resolved; but it is evident that the water is lost in at least two distinct steps.

TABLE 4: Core 3 Composite Thermal Analysis Results

Differential Scanning Calorimetry

	<u>Run 1</u>	<u>Run 2</u>
Transition 1		
Temp. Range (°C)	30 to 85	30 to 92
Temp. Peak Maximum (°C)	78	79
Onset Temp. (°C)	34	31
Enthalpy Change (cal/g)	180	--
Transition 2		
Temp. Range (°C)	104 to 139	94 to 134
Temp. Peak Maximum (°C)	112	106
Onset Temp. (°C)	105	101
Enthalpy Change (cal/g)	97	62
Transition 3		
Temp. Range (°C)	282 to 309	282 to 307
Temp. Peak Maximum (°C)	295	296
Onset Temp. (°C)	289	286
Enthalpy Change (cal/g)	5	5

Thermogravimetry

	<u>Run 1</u>	<u>Run 2</u>
Weight % Solids	44.7	45.4

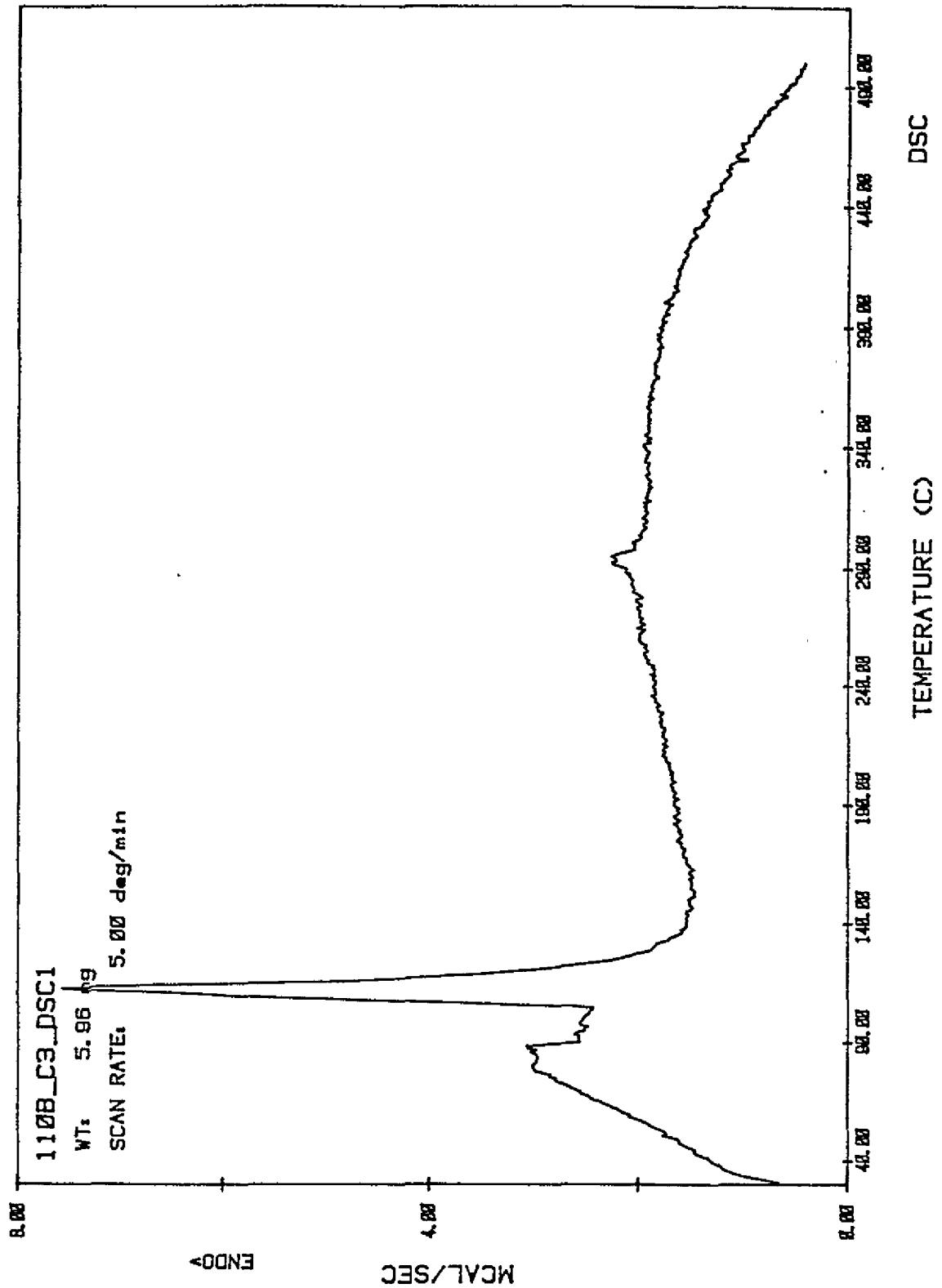


FIGURE 2. DSC Plot Core 3 Composite, Run 1

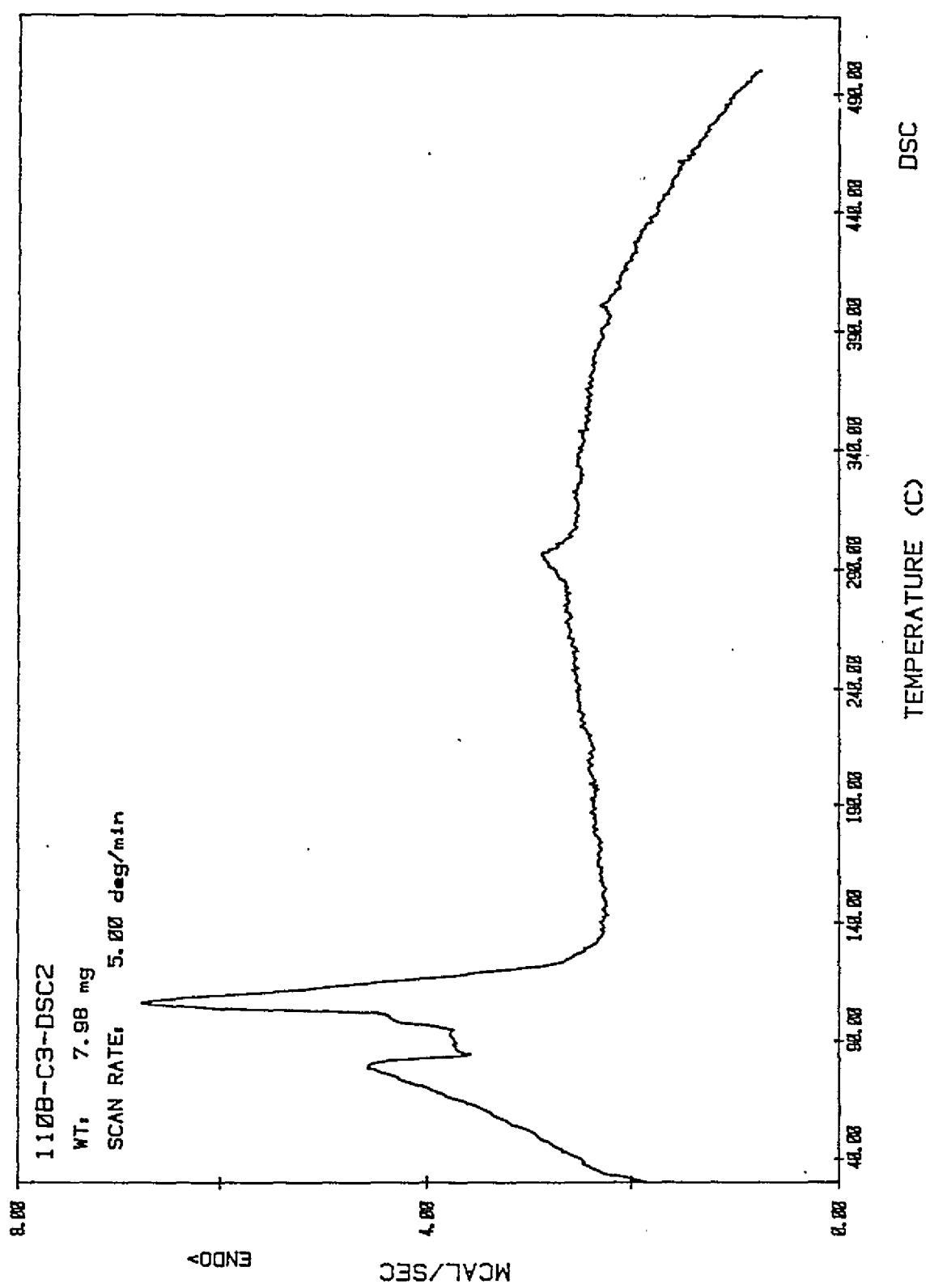


FIGURE 3. DSC Plot Core 3 Composite, Run 2

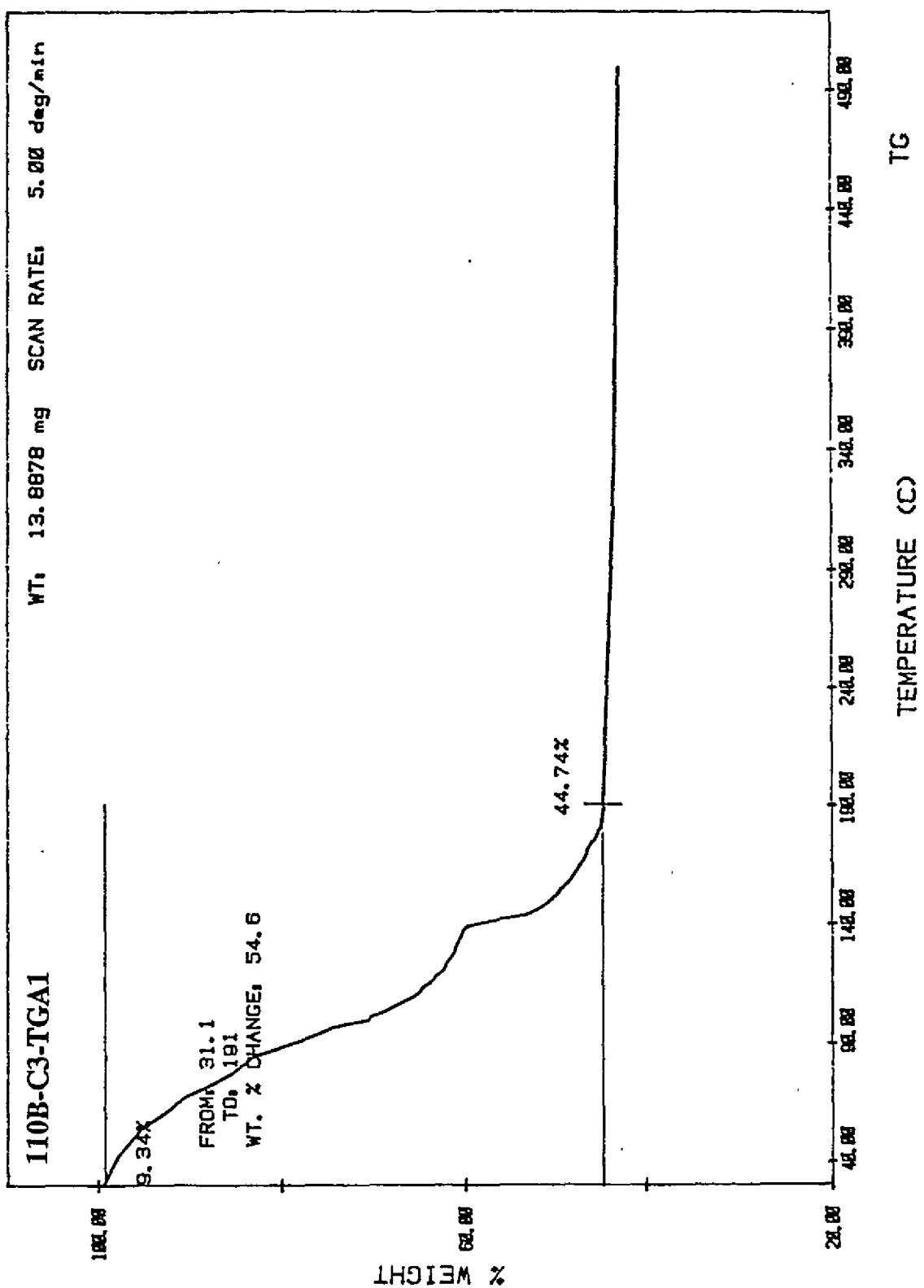


FIGURE 4. Core 3 Composite Thermogravimetric Curve, Run 1

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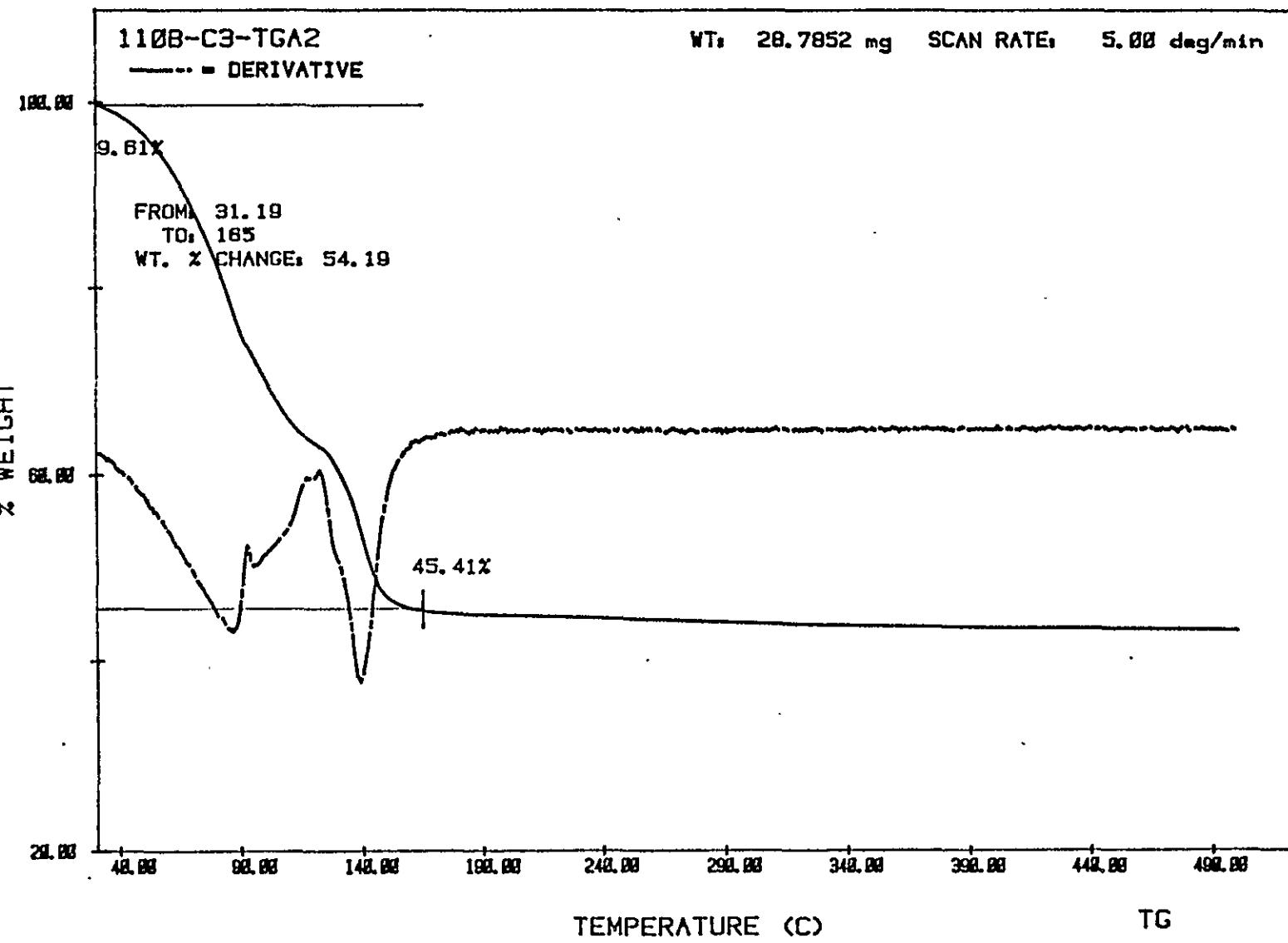


FIGURE 5. Core 3 Composite Thermogravimetric Curve, Run 2

TABLE 5: SST Core 3 Water Leach pH Values*

<u>Segment #</u>	<u>Sample #</u>	<u>pH</u>
3	89-1107-C-1	8.09
	89-1107-C-2	8.22
	89-1107-C-5	5.53
5	89-1109-C-1	8.66
	89-1109-C-2	7.90
	89-1109-C-5	5.91
Composite	89-0977-C-1	7.57
	89-0977-C-2	7.88
	89-0977-C-5	4.50

* Analysis completed following the method outlined in PNL-MA-599, Procedure WHC-053-1. Samples C-1 and C-2 are duplicates. Sample C-5 is a methods blank.

TABLE 6: SST Core 3 Weight-% Solids Values*

<u>Segment #</u>	<u>Sample #</u>	<u>Weight-% Solids</u>
3	89-0668-H-1	41.51
	89-0668-H-2	41.85
	89-0669-H-1	41.70
	89-0669-H-2	41.11
	89-1107-H-1	42.78
	89-1107-H-2	42.72
5	89-1109-H-1	42.77
	89-1109-H-2	42.55
Composite	89-0971-H-1	40.85
	89-0971-H-2	40.85
	89-0972-H-1	41.43
	89-0972-H-2	41.52
	89-0973-H-1	40.92
	89-0973-H-2	40.95
	89-0974-H-1	40.62
	89-0974-H-2	40.84
	89-0975-H-1	40.72
	89-0975-H-2	40.97
	89-0976-H-1	40.91
	89-0976-H-2	40.79
	89-0977-H-1	40.58
	89-0977-H-2	40.82

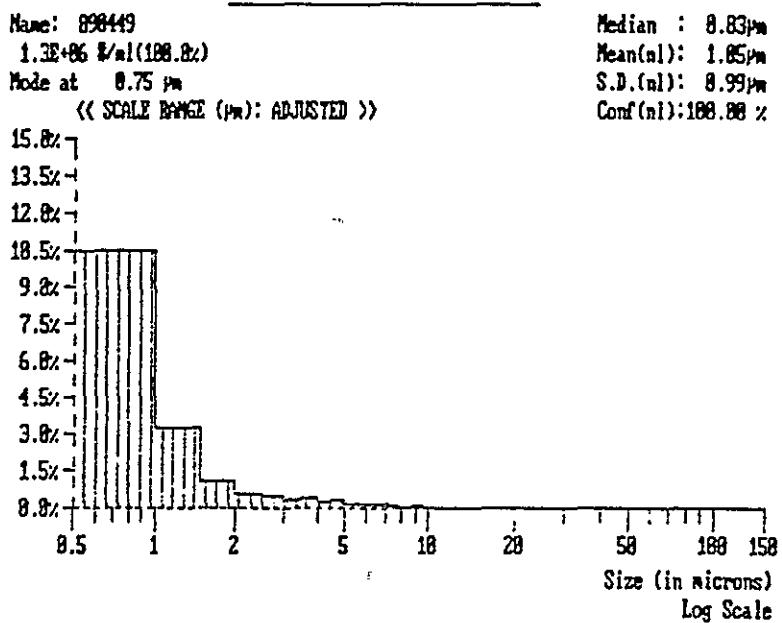
* Weight-% Solids were determined following the method outlined in PNL-MA-599, Procedure PNL-ALO-504. Samples H-1/H-2 are duplicates.

Particle Size Analysis

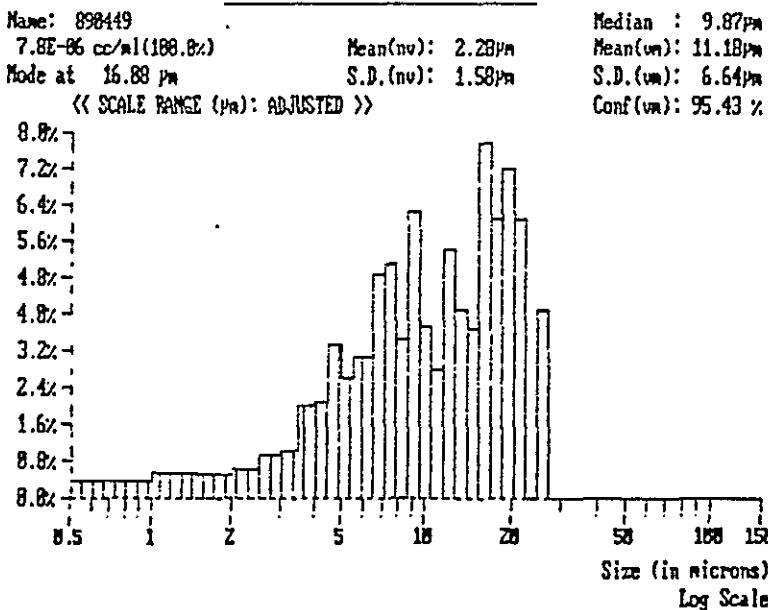
A particle size (PS) determination was completed on each segment in a core. The PS sample was taken shortly after segment extrusion and prior to segment homogenization. A Brinkmann Model 2010 Particle Size Analyzer was utilized for the determinations (PNL-597-2 50.3). This instrument utilizes a focused scanning laser to measure/count particles suspended in a liquid medium. Particle size data are reported as Probability Number Density graphs and Probability Volume graphs for each segment.

SST Core 3, Segment 2 Particle Size Analysis
Sample # 89-0449

PROBABILITY NUMBER DENSITY GRAPH



PROBABILITY VOLUME DENSITY GRAPH

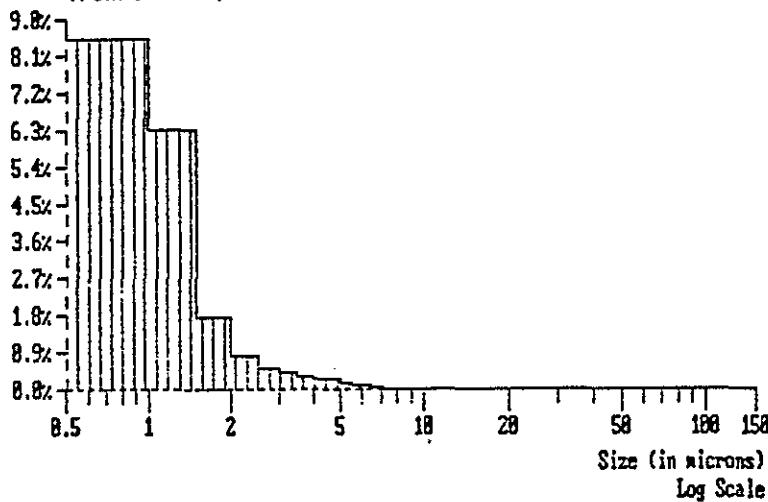


SST Core 3, Segment 3 Particle Size Analysis
Sample # 89-0450

PROBABILITY NUMBER DENSITY GRAPH

Name: 890450
4.82E-05 M/ml(100.0%)
Mode at 8.75 μm
« SCALE RANGE (μm): ADJUSTED »

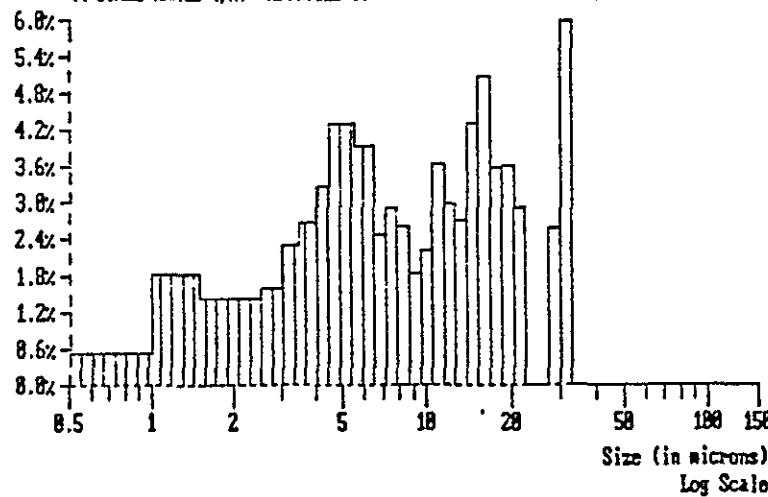
Median : 8.98 μm
Mean(nl): 1.89 μm
S.D.(nl): 8.76 μm
Conf(nl): 100.00 %



PROBABILITY VOLUME DENSITY GRAPH

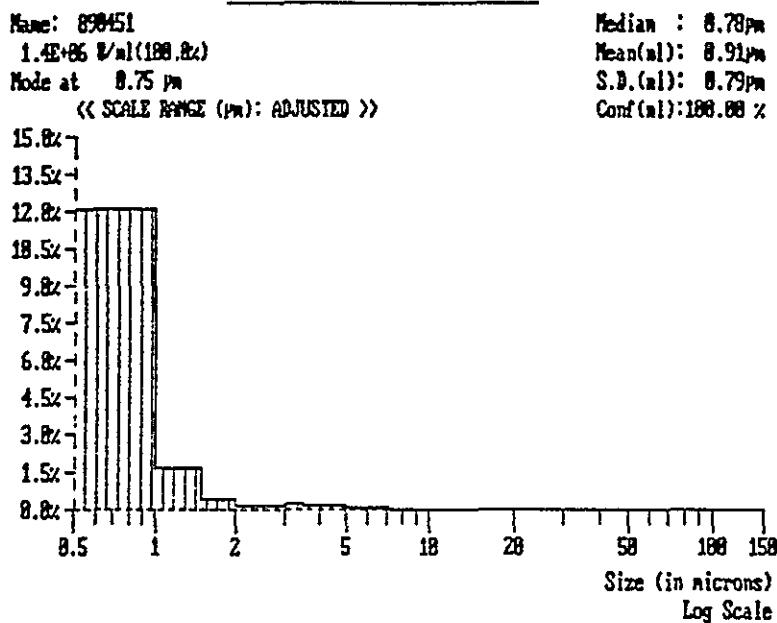
Name: 890450
1.4E-05 cc/ml(100.0%)
Mode at 31.29 μm
« SCALE RANGE (μm): ADJUSTED »

Median : 6.43 μm
Mean(vn): 9.77 μm
S.D.(vn): 8.45 μm
Conf(vn): 98.96 %

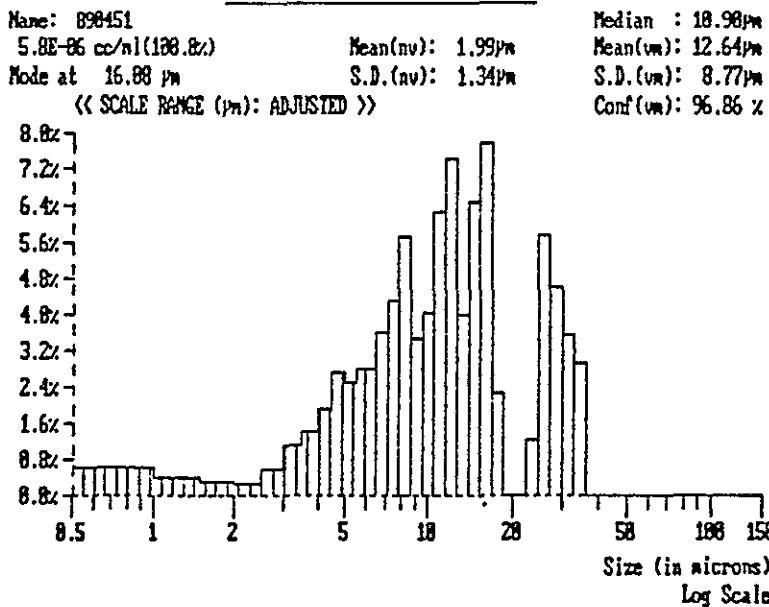


SST Core 3, Segment 4 Particle Size Analysis
Sample # 89-0451

PROBABILITY NUMBER DENSITY GRAPH

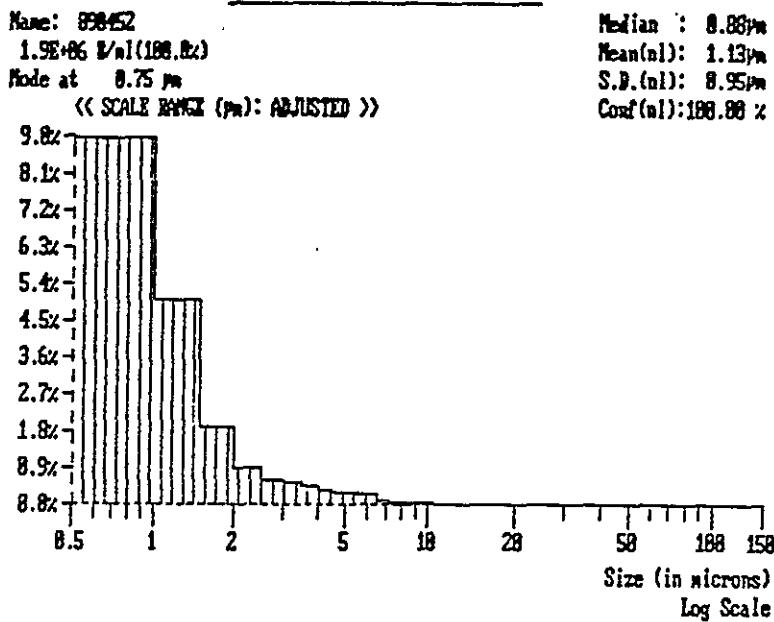


PROBABILITY VOLUME DENSITY GRAPH

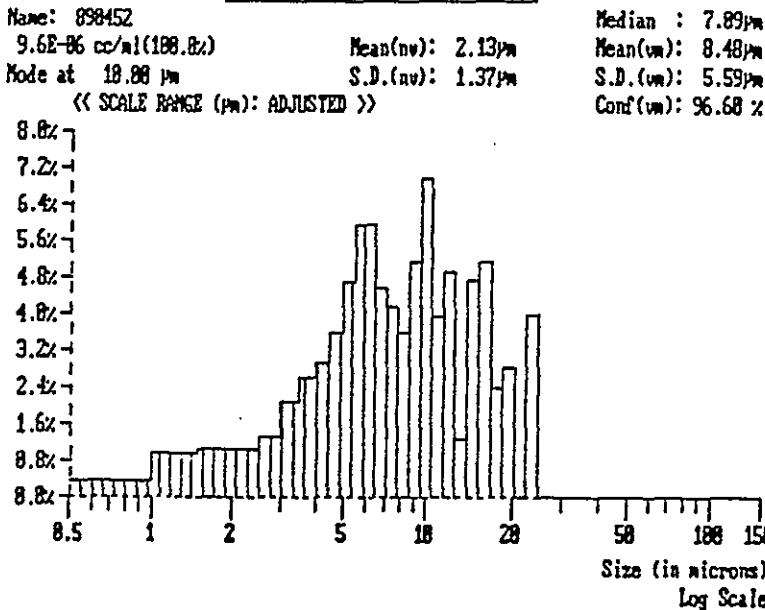


SST Core 3, Segment 5 Particle Size Analysis
Sample # 89-0452

PROBABILITY NUMBER DENSITY GRAPH



PROBABILITY VOLUME DENSITY GRAPH



INORGANIC DATA TABLES

Inorganic Fusion ICP Results

Selected segment or core composite samples were fused with potassium hydroxide (KOH) in a Ni crucible, the resulting melt dissolved in an acid solution (PNL-ALO-102), and the solution analyzed by ICP spectroscopy (PNL-SP-7). In all cases samples are prepared in duplicate. A Methods Blank was included with the Core 3 segment 5 sample. The Methods Blank involves the fusion of KOH without the addition of any sample. However, in all other respects the methods blank is prepared and analyzed exactly like the regular sample. With the exception of detection limits (DL) and quantitation limits (QL), all data are reported in units of weight percent (Wt %) wet sample. Note that K and Ni are not reported due to preparation. If concentrations fall below the estimated DL then "< DL" will be listed. If the value falls between the DL and QL the the value will be reported in parentheses. Detection limits were estimated to be three times the standard deviation of the background. Quantitation limits were estimated as ten times the standard deviation of the background.

Samples for which data are included in the Core 3 Data Package are the Segment 3 homogenization check sample (Table 7.1), Segment 5 analysis sample (Table 7.2), and three core composite preparation/ homogenization check samples (Tables 7.3, 7.4, and 7.5). The segment or composite preparation/homogenization check analysis protocol includes duplicate sample prep and analyses of two samples, one from the top of the mixture and the other from the bottom.

In Tables 7.1 through 7.5, column 1 contains a list of atomic symbols of 41 elements for which data are provided. Columns 2 and 3 contain duplicate analyses of a "top" sample. Column 4 lists the relative percent difference (RPD) between the two analyses. Columns 5 and 6 contain duplicate analyses of a "bottom" sample. Column 7 lists the RPD for the data listed in columns 5 and 6. The last two columns contain the DL and QL, respectively, in units of micrograms per milliliter ($\mu\text{g}/\text{mL}$). The DL or QL in Wt % can be calculated for any element by multiplying the listed DL or QL (in $\mu\text{g}/\text{mL}$) by the appropriate Wt % Factor in row 3.

In Table 7.2 columns 2 and 3 contain duplicate analyses of homogenized segment 5 sample. Column 4 lists data for the methods blank for this suite of analyses. Columns 5 and 6 list estimated DL and QL values in $\mu\text{g}/\text{mL}$. Column 7 lists the average values for columns 2 and 3, and the last column tabulates the RPD between the duplicates.

TABLE 7.1: SST Core 3, Segment 3 Fusion ICP (Homogenization Check)

Samp Log#: 89-668a1 89-668b1		89-669a1 89-669b1					
Dilution:	1.00	1.00	1.00	1.00			
Wt% Factor	0.46710	0.52446	0.46140	0.44433			
ICP Run #	1893	1894	1895	1896	DL	DL	
Ag	<DL	<DL	RPD	<DL	<DL	(ug/mL)	0.0095 0.0317
Al	(0.1200)	(0.1294)	7.5%	(0.1149)	(0.1218)	5.9%	0.1453 0.4842
As	<DL	<DL		<DL	<DL		0.0942 0.3141
B	<DL	<DL		<DL	<DL		0.0610 0.2033
Ba	(0.0022)	(0.0039)	57.3%	(0.0022)	(0.0019)	14.7%	0.0031 0.0102
Be	<DL	<DL		<DL	<DL		0.0005 0.0016
Ca	0.1914	0.2007	4.7%	0.1942	0.1681	14.4%	0.0015 0.0050
Cd	<DL	(0.0032)		<DL	<DL		0.0054 0.0180
Ce	<DL	<DL		<DL	<DL		0.1826 0.6086
Co	<DL	<DL		<DL	<DL		0.2347 0.7823
Cr	0.0760	0.0767	0.9%	0.0746	0.0692	7.5%	0.0074 0.0245
Cu	(0.0075)	(0.0090)	17.5%	<DL	<DL		0.0136 0.0452
Dy	<DL	<DL		<DL	<DL		0.0113 0.0377
Fe	1.8408	1.8345	0.3%	1.7984	1.6466	8.8%	0.0087 0.0290
K							0.4396 1.4652
La	<DL	<DL		<DL	<DL		0.0155 0.0515
Li	<DL	<DL		<DL	<DL		0.0115 0.0385
Mg	0.0186	0.0183	1.5%	0.0166	0.0157	6.0%	0.0013 0.0043
Mn	0.0074	0.0071	4.0%	0.0090	0.0071	24.0%	0.0012 0.0040
Mo	<DL	<DL		<DL	<DL		0.0093 0.0311
Na	8.9654	8.9294	0.4%	9.1287	8.3627	8.8%	0.0848 0.2828
Nd	<DL	<DL		<DL	<DL		0.0667 0.2224
Ni							0.0229 0.0763
P	1.8018	1.7867	0.8%	1.8422	1.5647	16.3%	0.5047 1.6823
Pb	(0.0653)	(0.0632)	3.3%	(0.0603)	(0.0520)	14.7%	0.1038 0.3460
Re	<DL	<DL		<DL	<DL		0.0156 0.0521
Rh	<DL	<DL		<DL	<DL		0.0993 0.3311
Ru	<DL	<DL		<DL	<DL		0.0447 0.1490
Sb	<DL	<DL		<DL	<DL		0.2486 0.8288
Se	<DL	<DL		<DL	<DL		0.1644 0.5480
Si	0.9043	0.9130	1.0%	0.8780	1.0204	15.0%	0.0672 0.2241
Sr	0.0275	0.0278	0.9%	0.0281	0.0247	12.9%	0.0014 0.0046
Te	<DL	<DL		<DL	<DL		0.0768 0.2561
Th	<DL	<DL		<DL	<DL		0.1518 0.5061
Ti	<DL	<DL		<DL	<DL		0.0104 0.0348
Tl	<DL	<DL		<DL	<DL		1.2834 4.2779
U	<DL	<DL		<DL	<DL		1.4268 4.7561
V	<DL	<DL		<DL	<DL		0.0092 0.0307
Zn	0.0177	0.0163	8.5%	0.0178	0.0142	22.4%	0.0031 0.0104
Zr	<DL	<DL		<DL	<DL		0.0110 0.0368
Bi	2.8727	2.8164	2.0%	2.8468	2.5327	11.7%	

TABLE 7.2: SST Core 3, Segment 5 Fusion ICP

Samp Log#:	89-1109a1	89-1109a2	89-1109a3				
Dilution:	1.00	1.00	1.00	DL	QL	89-1109a1 89-1109a2 Average	RPD
Wt% Factor	0.45621	0.45801	0.45711				
ICP Run #	218	217	216				
Ag	<DL	<DL	<DL	0.0121	0.0402	N/A	
Al	<DL	<DL	<DL	0.1409	0.4696	N/A	
As	<DL	<DL	<DL	0.1095	0.3650	N/A	
B	<DL	<DL	<DL	0.0953	0.3178	N/A	
Ba	(0.0029)	(0.0030)	(0.0020)	0.0027	0.0090	0.0030	1.9%
Be	<DL	<DL	<DL	0.0004	0.0015	N/A	
Ca	0.0646	0.0617	0.0217	0.0007	0.0024	0.0632	4.5%
Cd	(0.0064)	(0.0066)	0.0094	0.0054	0.0179	0.0065	2.5%
Ce	<DL	<DL	<DL	0.1917	0.6390	N/A	
Co	<DL	<DL	<DL	0.2447	0.8156	N/A	
Cr	0.0697	0.0706	<DL	0.0117	0.0389	0.0701	1.3%
Cu	(0.0086)	(0.0071)	(0.0076)	0.0152	0.0507	0.0079	20.0%
Dy	<DL	<DL	<DL	0.0132	0.0440	N/A	
Fe	1.6642	1.6614	(0.0074)	0.0083	0.0275	1.6628	0.2%
K				0.3827	1.2758		
La	<DL	<DL	<DL	0.0179	0.0597	N/A	
Li	<DL	<DL	<DL	0.0084	0.0278	N/A	
Mg	0.0141	0.0124	(0.0023)	0.0016	0.0054	0.0133	13.1%
Mn	0.0063	0.0062	(0.0017)	0.0019	0.0063	0.0062	0.3%
Mo	<DL	<DL	<DL	0.0105	0.0348	N/A	
Na	9.5700	9.6380	<DL	0.2262	0.7539	9.6040	0.7%
Nd	<DL	<DL	<DL	0.0930	0.3101	N/A	
Ni				0.0238	0.0792		
P	1.8651	1.8428	<DL	0.7207	2.4022	1.8539	1.2%
Pb	<DL	<DL	<DL	0.0840	0.2800	N/A	
Re	<DL	<DL	<DL	0.0194	0.0648	N/A	
Rh	<DL	<DL	<DL	0.1269	0.4229	N/A	
Ru	<DL	<DL	<DL	0.0334	0.1113	N/A	
Sb	<DL	<DL	<DL	0.3413	1.1376	N/A	
Se	<DL	<DL	<DL	0.1290	0.4301	N/A	
Si	0.8708	0.8743	<DL	0.0618	0.2060	0.8726	0.4%
Sr	0.0228	0.0237	<DL	0.0012	0.0039	0.0233	3.7%
Te	<DL	<DL	<DL	0.0994	0.3314	N/A	
Th	<DL	<DL	<DL	0.1305	0.4349	N/A	
Ti	<DL	<DL	<DL	0.0101	0.0335	N/A	
Tl	<DL	<DL	<DL	2.0523	6.8410	N/A	
U	<DL	<DL	<DL	1.3016	4.3387	N/A	
V	<DL	<DL	<DL	0.0095	0.0317	N/A	
Zn	0.0195	0.0167	(0.0074)	0.0054	0.0180	0.0181	15.5%
Zr	<DL	<DL	<DL	0.1330	0.4432	N/A	
Bi	1.8933	1.9924	<DL			1.9428	5.1%

* Methods blank - average sample weight used to calculate wt%.

TABLE 7.3: SST Core 3, Composite 1 Fusion ICP

Samp Log#:	89-971a1	89-971b1	89-972a1		89-972b1	DL	QL	
Dilution:	1.00	1.00	1.00	1.00		(ug/mL)	(ug/mL)	
Wt% Factor	0.47840	0.49265		0.41650	0.46527			
ICP Run #	1867	1868		1869	1870			
Ag	<DL	<DL	RPD	<DL	<DL	0.0095	0.0317	
Al	<DL	<DL		(0.0768)	(0.0700)	0.1453	0.4842	
As	<DL	<DL		<DL	<DL	0.0942	0.3141	
B	<DL	<DL		<DL	<DL	0.0610	0.2033	
Ba	(0.0020)	(0.0024)	20.6%	(0.0026)	(0.0025)	4.5%		
Be	<DL	<DL		<DL	<DL	0.0005	0.0016	
Ca	0.1050	0.1039	1.1%	0.0974	0.1086	10.8%		
Cd	0.0105	(0.0067)	44.0%	(0.0055)	(0.0057)	4.0%		
Ce	<DL	<DL		<DL	<DL	0.1826	0.6086	
Co	<DL	<DL		<DL	<DL	0.2347	0.7823	
Cr	0.0814	0.0754	7.6%	0.0811	0.0804	0.9%		
Cu	<DL	(0.0070)		(0.0089)	(0.0084)	5.7%		
Dy	<DL	<DL		<DL	<DL	0.0113	0.0377	
Fe	1.7686	1.7042	3.7%	1.8381	1.8233	0.8%		
K						0.4396	1.4652	
La	<DL	<DL		<DL	<DL	0.0155	0.0515	
Li	<DL	<DL		<DL	<DL	0.0115	0.0385	
Mg	0.0140	0.0131	6.7%	0.0137	0.0135	1.5%		
Mn	0.0097	0.0068	35.2%	0.0114	0.0074	42.3%		
Mo	<DL	<DL		<DL	<DL	0.0093	0.0311	
Na	9.2073	8.8380	4.1%	9.5225	9.4539	0.7%		
Nd	<DL	<DL		<DL	<DL	0.0667	0.2224	
Ni						0.0229	0.0763	
P	1.7072	1.6208	5.2%	1.8116	1.7627	2.7%		
Pb	<DL	<DL		<DL	<DL	0.1038	0.3460	
Re	<DL	<DL		<DL	<DL	0.0156	0.0521	
Rh	<DL	<DL		<DL	<DL	0.0993	0.3311	
Ru	<DL	<DL		<DL	<DL	0.0447	0.1490	
Sb	<DL	<DL		<DL	<DL	0.2486	0.8288	
Se	(0.0954)	(0.0892)	6.8%	(0.0895)	<DL	0.1644	0.5480	
Si	0.9154	0.8949	2.3%	0.9580	0.9516	0.7%		
Sr	0.0247	0.0239	3.1%	0.0257	0.0254	1.0%		
Te	<DL	<DL		<DL	<DL	0.0768	0.2561	
Th	<DL	<DL		<DL	<DL	0.1518	0.5061	
Ti	<DL	<DL		<DL	<DL	0.0104	0.0348	
Tl	<DL	<DL		<DL	<DL	1.2834	4.2779	
U	<DL	<DL		<DL	<DL	1.4268	4.7561	
V	<DL	<DL		<DL	<DL	0.0092	0.0307	
Zn	0.0182	0.0185	1.6%	0.0256	0.0164	43.9%		
Zr	<DL	<DL		<DL	<DL	0.0031	0.0104	
Bi	2.3011	2.0346	12.3%	2.2075	2.2985	4.0%	0.0110	0.0368

TABLE 7.4: SST Core 3, Composite 2 Fusion ICP

Samp Log#:	89-973a1	89-973b1	89-974a1		89-974b1		1.00	1.00	DL	QL
Dilution:	1.00	1.00	1.00	1.00	1.00	1.00			(ug/mL)	(ug/mL)
Wt% Factor	0.44311	0.49843	0.49567		0.48175					
ICP Run #	1871	1872	1900	1901						
Ag	<DL	<DL	<DL	<DL					0.0095	0.0317
Al	<DL	(0.1121)	(0.1268)	(0.1265)	0.2%				0.1453	0.4842
As	<DL	<DL	(0.0498)	<DL					0.0942	0.3141
B	<DL	<DL	<DL	<DL					0.0610	0.2033
Ba	(0.0017)	(0.0028)	46.9%	(0.0031)	(0.0020)	41.0%			0.0031	0.0102
Be	<DL	<DL	<DL	<DL					0.0005	0.0016
Ca	0.0978	0.0989	1.1%	0.1015	0.0998	1.7%			0.0015	0.0050
Cd	(0.0024)	(0.0045)	60.2%	(0.0048)	(0.0027)	56.2%			0.0054	0.0180
Ce	<DL	<DL	<DL	<DL					0.1826	0.6086
Co	<DL	<DL	<DL	<DL					0.2347	0.7823
Cr	0.0759	0.0797	5.0%	0.0844	0.0804	4.9%			0.0074	0.0245
Cu	<DL	(0.0103)		(0.0120)	(0.0080)	39.5%			0.0136	0.0452
Dy	<DL	<DL	<DL	<DL					0.0113	0.0377
Fe	1.7495	1.7605	0.6%	1.8896	1.7784	6.1%			0.0087	0.0290
K									0.4396	1.4652
La	<DL	<DL	<DL	<DL					0.0155	0.0515
Li	<DL	<DL	<DL	<DL					0.0115	0.0385
Mg	0.0130	0.0148	12.8%	0.0150	0.0150	0.6%			0.0013	0.0043
Mn	0.0057	0.0061	6.2%	0.0075	0.0077	1.6%			0.0012	0.0040
Mo	<DL	(0.0052)		(0.0054)	<DL				0.0093	0.0311
Na	9.1887	9.0399	1.6%	9.4018	9.1589	2.6%			0.0848	0.2828
Nd	<DL	<DL	<DL	<DL					0.0667	0.2224
Ni									0.0229	0.0763
P	1.5903	1.8481	15.0%	1.9532	1.8927	3.1%			0.5047	1.6823
Pb	<DL	<DL		(0.0617)	(0.1043)	51.3%			0.1038	0.3460
Re	<DL	<DL	<DL	<DL					0.0156	0.0521
Rh	<DL	<DL	<DL	<DL					0.0993	0.3311
Ru	<DL	<DL	<DL	<DL					0.0447	0.1490
Sb	(0.1293)	<DL	<DL	<DL					0.2486	0.8288
Se	<DL	<DL	<DL	<DL					0.1644	0.5480
Si	0.8990	0.9007	0.2%	0.9562	0.9150	4.4%			0.0672	0.2241
Sr	0.0244	0.0246	0.6%	0.0257	0.0245	4.6%			0.0014	0.0046
Te	<DL	<DL	<DL	<DL					0.0768	0.2561
Th	<DL	<DL	<DL	<DL					0.1518	0.5061
Ti	<DL	<DL	<DL	<DL					0.0104	0.0348
Tl	<DL	<DL	<DL	<DL					1.2834	4.2779
U	<DL	<DL	<DL	<DL					1.4268	4.7561
V	<DL	<DL	<DL	<DL					0.0092	0.0307
Zn	0.0157	0.0177	11.8%	0.0182	0.0189	3.7%			0.0031	0.0104
Zr	<DL	<DL	<DL	<DL					0.0110	0.0368
Bi	2.3396	2.2579	3.6%	2.3643	1.9848	17.5%				

TABLE 7.5: SST Core 3, Composite 3 Fusion ICP

Samp Log#:	89-975a1	89-975b1		89-976a1	89-976b1			
Dilution:	1.00	1.00		1.00	1.00		DL	QL
Wt% Factor	0.44093	0.44037		0.46590	0.51837			
ICP Run #	1902	1903		1884	1885			
Ag	<DL (0.0042)	<DL (0.1328)		<DL	<DL		(ug/mL)	(ug/mL)
Al	0.1229	0.1328	7.8%	<DL	<DL		0.0095	0.0317
As	<DL	<DL		<DL	<DL		0.1453	0.4842
B	<DL	<DL		<DL	<DL		0.0942	0.3141
Ba	(0.0025)	(0.0029)	12.9%	(0.0021)	<DL		0.0610	0.2033
Be	<DL	<DL		<DL	<DL		0.0005	0.0016
Ca	0.1010	0.0994	1.6%	0.1045	0.1017	2.7%	0.0015	0.0050
Cd	(0.0036)	(0.0051)	34.6%	(0.0034)	<DL		0.0054	0.0180
Ce	<DL	<DL		<DL	<DL		0.1826	0.6086
Co	<DL	<DL		<DL	<DL		0.2347	0.7823
Cr	0.0834	0.0846	1.4%	0.0771	0.0760	1.5%	0.0074	0.0245
Cu	0.1024	(0.0120)	158.2%	(0.0073)	<DL		0.0136	0.0452
Dy	<DL	<DL		<DL	<DL		0.0113	0.0377
Fe	1.8374	1.8478	0.6%	1.8002	1.7743	1.4%	0.0087	0.0290
K							0.4396	1.4652
La	<DL	<DL		<DL	<DL		0.0155	0.0515
Li	<DL	<DL		<DL	<DL		0.0115	0.0385
Mg	0.0141	0.0150	6.5%	0.0133	0.0144	7.8%	0.0013	0.0043
Mn	0.0068	0.0114	49.7%	0.0086	0.0124	35.9%	0.0012	0.0040
Mo	(0.0064)	(0.0057)	11.0%	<DL	<DL		0.0093	0.0311
Na	9.4883	9.4890	0.0%	9.2229	9.2679	0.5%	0.0848	0.2828
Nd	<DL	<DL		<DL	<DL		0.0667	0.2224
Ni							0.0229	0.0763
P	2.0004	1.9834	0.9%	1.6484	1.6412	0.4%	0.5047	1.6823
Pb	(0.0475)	(0.0584)	20.4%	<DL	<DL		0.1038	0.3460
Re	<DL	(0.0071)		<DL	<DL		0.0156	0.0521
Rh	<DL	<DL		<DL	<DL		0.0993	0.3311
Ru	<DL	<DL		<DL	<DL		0.0447	0.1490
Sb	<DL	<DL		<DL	<DL		0.2486	0.8288
Se	<DL	<DL		<DL	<DL		0.1644	0.5480
Si	0.9548	0.9686	1.4%	0.9030	0.8929	1.1%	0.0672	0.2241
Sr	0.0259	0.0257	0.6%	0.0246	0.0244	0.8%	0.0014	0.0046
Te	<DL	<DL		<DL	<DL		0.0768	0.2561
Th	<DL	<DL		<DL	<DL		0.1518	0.5061
Tl	<DL	<DL		<DL	<DL		0.0104	0.0348
U	<DL	<DL		<DL	<DL		1.2834	4.2779
V	<DL	<DL		<DL	<DL		1.4268	4.7561
Zn	0.0159	0.0274	53.2%	0.0151	0.0248	48.3%	0.0092	0.0307
Zr	<DL	<DL		<DL	<DL		0.0031	0.0104
Bi	2.1605	2.0389	5.8%	2.2596	2.2394	0.9%	0.0110	0.0368

Inorganic Acid Leach ICP Results

Selected segment or core composite samples are leached with nitric acid following the EPA SW-846 protocols (PNL-ALO-101). For a single segment or core composite sample five aliquots are prepared for analysis. These include duplicate sample preps, a spiked sample prep, a spiked control sample, and a methods blank. The Spike Control is prepared by adding the spike solution to an appropriate amount of deionized water. Each of these aliquots are analyzed by ICP spectroscopy at a 1X and 5X dilution (PNL-SP-7). ICP analysis data are reported for each dilution, as well as a percent difference (% Dif) between the analyses. With the exception of detection limits (DL) and quantitation limits (QL), all data are reported in units of weight percent (Wt %) wet sample. If concentrations fall below the estimated DL then "< DL" will be listed. If the value falls between the DL and QL the the value will be reported in parentheses. Detection limits were estimated to be three times the standard deviation of the background. Quantitation limits were estimated as ten times the standard deviation of the background.

Acid Leach ICP samples in the Core 3 Data Package include Segment 3 (Table 7.6), Segment 5 (Table 7.7), and the Core Composite (Table 7.8). Column 1 of each of these tables list the atomic symbols of each of the elements for which data are reported. Columns 2 and 3 tabulate the 1X and 5X dilution analysis data for a single sample preparation. Column 4 lists the % Dif between the dilutions. This sequence is repeated for columns 5, 6 and 7, and 8, 9 and 10 for the duplicate and the Methods Blank. Columns 11 and 12 list DL and QL values, respectively, in units of micrograms per milliliter ($\mu\text{g}/\text{ml}$). The DL or QL in Wt % can be calculated for any element by multiplying the listed DL or QL (in $\mu\text{g}/\text{ml}$) by the appropriate Wt % Factor in row 3.

The second page of each table contains primarily quality control (QC) data. Column 2 lists the average for the duplicate analyses. Column 3 provides the relative percent difference (RPD) between the analyses. Column 4 tabulates the calculated Wt % Spike added to spiked sample. Columns 5 and 6 list values for the 1X and 5X dilutions on the spiked sample. Column 7 lists the % Dif, and column 8 the percent recovery (% Rec). Columns 9 and

10 report values for the 1X and 5X dilutions of the Spike Control sample and column 11 reports the % Dif. Column 12 lists the calculated concentrations of elements in the Spike Control and Column 13 reports % Rec in the Spike Control sample analysis.

TABLE 7.6: SST Core 3, Segment 3 Acid Leach ICP

Samp Log#:	89-1107b1	89-1107b1	89-1107b2	89-1107b2	89-1107b5	89-1107b5	Dilution:	1.00	5.00	1.00	5.00	1.00	5.00		
Wt% Factor	0.02295	0.11476	0.02435	0.12174	0.02363	0.11815								DL	QL
ICP Run #	180	173	179	172	175	169									
Weight %	(Wt %)	(Wt %)	%dif	(Wt %)	(Wt %)	%dif	(Wt% *)	(Wt% *)	%dif	(ug/mL)	(ug/mL)				
Ag	0.0012	(0.0006)		0.0013	(0.0013)	<DL	<DL	<DL		0.0045	0.0150				
Al	0.1204	0.1208	0.3%	0.1224	0.1244	1.6%	(0.0022)	<DL		0.0542	0.1806				
As	<DL	<DL		<DL	<DL		<DL	<DL		0.0551	0.1838				
B	0.0290	(0.0265)		0.0325	(0.0301)		0.0247	(0.0255)		0.1188	0.3960				
Ba	0.0016	0.0017	4.6%	0.0016	0.0019	18.5%	0.0001	(0.0002)		0.0006	0.0019				
Be	<DL	<DL		<DL	(0.0000)		<DL	<DL		0.0001	0.0004				
Ca	0.1892	0.1893	0.1%	0.2202	0.2182	0.9%	0.0134	0.0130	3.3%	0.0115	0.0383				
Cd	0.0005	0.0008	71.1%	0.0004	0.0009	*****	0.0001	(0.0003)		0.0016	0.0055				
Ce	(0.0054)	(0.0127)		(0.0052)	(0.0248)		<DL	<DL		0.0770	0.2568				
Co	<DL	<DL		<DL	(0.0278)		<DL	<DL		0.1225	0.4082				
Cr	0.0848	0.0847	0.1%	0.0835	0.0830	0.6%	<DL	<DL		0.0076	0.0253				
Cu	0.0027	0.0031	16.4%	0.0027	0.0040	49.4%	(0.0002)	<DL		0.0053	0.0177				
Dy	<DL	<DL		<DL	(0.0013)		<DL	<DL		0.0048	0.0160				
Fe	2.0330	2.0494	0.8%	2.0206	2.0186	0.1%	0.0013	0.0011	10.7%	0.0027	0.0090				
K	0.0335	(0.0465)		0.0307	0.0648	*****	<DL	<DL		0.1443	0.4810				
La	0.0040	0.0045	12.5%	0.0040	0.0055	38.3%	<DL	<DL		0.0062	0.0207				
Li	<DL	<DL		<DL	<DL		<DL	<DL		0.0076	0.0252				
Mg	0.0207	0.0202	2.4%	0.0213	0.0207	2.8%	0.0029	(0.0023)		0.0093	0.0310				
Mn	0.0065	0.0065	1.1%	0.0065	0.0065	0.7%	<DL	<DL		0.0018	0.0061				
Mo	<DL	<DL		<DL	<DL		<DL	<DL		0.0650	0.2168				
Na	10.1810	10.1618	0.2%	10.1951	10.0652	1.3%	0.0335	(0.0311)		0.1139	0.3798				
Nd	(0.0017)	(0.0053)		(0.0017)	(0.0107)		<DL	<DL		0.0338	0.1125				
Ni	0.0021	0.0023	6.1%	0.0022	0.0030	37.3%	<DL	<DL		0.0045	0.0151				
P	1.8746	1.9310	3.0%	1.9020	1.9692	3.5%	<DL	<DL		0.7040	2.3465				
Pb	0.0739	0.0631	14.6%	0.0750	0.0627	16.4%	<DL	<DL		0.0220	0.0733				
Re	0.0007	(0.0011)		0.0007	(0.0015)		<DL	<DL		0.0051	0.0170				
Rh	<DL	<DL		<DL	(0.0103)		<DL	<DL		0.0572	0.1907				
Ru	<DL	<DL		<DL	<DL		<DL	<DL		0.0174	0.0581				
Sb	<DL	<DL		<DL	<DL		<DL	<DL		0.2325	0.7749				
Se	<DL	<DL		<DL	<DL		<DL	<DL		0.1211	0.4036				
Si	0.0959	0.0812	15.3%	0.0680	0.0621	8.7%	0.0264	0.0229	13.4%	0.0177	0.0591				
Sr	0.0319	0.0314	1.7%	0.0317	0.0310	2.5%	0.0000	(0.0001)		0.0006	0.0021				
Te	(0.0021)	<DL		(0.0019)	<DL		<DL	<DL		0.0543	0.1810				
Th	<DL	<DL		<DL	(0.0127)		<DL	<DL		0.0500	0.1665				
Ti	0.0013	0.0015	17.9%	0.0013	0.0020	54.0%	(0.0001)	(0.0004)		0.0030	0.0100				
Tl	<DL	<DL		<DL	<DL		<DL	<DL		2.6620	8.8733				
U	0.1199	(0.1800)		0.1194	0.2906	*****	<DL	<DL		0.6774	2.2579				
V	(0.0002)	<DL		(0.0001)	(0.0008)		<DL	<DL		0.0033	0.0110				
Zn	0.0093	0.0069	25.2%	0.0072	0.0070	3.8%	0.0009	<DL		0.0061	0.0203				
Zr	0.0009	(0.0011)		0.0008	(0.0015)		<DL	<DL		0.0042	0.0139				
Bi	1.9693			0.4366			0.0279								

* Methods Blank - average sample weight used to calculate wt%.

TABLE 7.6: SST Core 3, Segment 3 Acid Leach ICP (Cont'd)

	89-1107b1		89-1107b3		<Sample ID>		89-1107b4		89-1107b4		
	89-1107b2	Average	Spike Added	Spike+ Sample	Spike+ Sample	<Dilution>	1.00	5.00	Spike Control	Spike Control	Spike STD
Ag	(Wt %)	RPD	(Wt %)	(Wt %)	(Wt %)	% Dif	% Rec	(ug/mL)	(ug/mL)	(ug/mL)	% rec
Al	0.0013	11.5%	0.0012	(0.0018)	0.1263	1.5%	94.5%	75.3	73.2	80.0	94.1%
As	N/A		0.3659	0.3458	0.3587	3.7%	98.0%	78.3	75.6	80.0	97.9%
B	0.0307	11.5%		0.0361	(0.0353)			2.0	1.9	2.0	99.0%
Ba	0.0016	0.7%	0.3659	0.3600	0.3554	1.3%	98.0%	78.3	75.6	80.0	97.9%
Be	N/A		0.0091	0.0091	0.0091	0.2%	99.1%				
Ca	0.2047	15.1%		0.2227	0.2233	0.3%					
Cd	0.0004	7.3%	0.0091	0.0146	0.0158	8.5%	154.4%	3.2	3.3	2.0	158.5%
Ce	0.0053	4.8%		(0.0043)	(0.0151)						
Co	N/A		0.0915	0.0888	0.1054	18.6%	97.1%	19.2	21.7	20.0	96.1%
Cr	0.0841	1.6%	0.0366	0.1203	0.1204	0.1%	98.9%	7.9	7.7	8.0	99.1%
Cu	0.0027	1.3%	0.0457	0.0489	0.0500	2.1%	101.1%	10.0	10.0	10.0	100.2%
Dy	N/A			<DL	(0.0007)						
Fe	2.0268	0.6%		2.0322	2.0525	1.0%					
K	0.0321	8.7%		0.0315	(0.0549)						
La	0.0040	1.5%		0.0040	0.0047	19.2%					
Li	N/A			<DL	<DL						
Mg	0.0210	2.8%		0.0211	0.0207	1.9%					
Mn	0.0065	0.5%	0.0915	0.0953	0.0952	0.1%	97.1%	19.5	18.9	20.0	97.6%
Mo	N/A			<DL	<DL						
Na	10.1880	0.1%		10.2799	10.2307	0.5%					
Nd	0.0017	4.2%		(0.0013)	(0.0060)						
Ni	0.0022	2.2%	0.0915	0.0929	0.0945	1.7%	99.1%	20.2	19.7	20.0	101.0%
P	1.8883	1.5%		1.9755	1.9851	0.5%					
Pb	0.0744	1.4%	0.0915	0.1628	0.1633	0.3%	96.6%	19.5	19.2	20.0	97.7%
Re	0.0007	7.4%		0.0007	(0.0015)						
Rh	N/A			<DL	<DL						
Ru	N/A			<DL	<DL						
Sb	N/A		0.0915	0.0739	(0.0571)						
Se	N/A		0.3659	0.3160	0.3224	2.0%	80.8%	16.9	11.6	20.0	84.6%
Si	0.0819	34.0%		0.2300	0.2008	12.7%					
Sr	0.0318	0.5%		0.0318	0.0313	1.6%					
Te	0.0020	12.3%		(0.0040)	(0.0078)						
Th	N/A			<DL	<DL						
Ti	0.0013	4.8%		0.0011	0.0015	33.6%					
Tl	N/A		0.3659	0.3098	(0.3981)						
U	0.1196	0.4%		0.1110	(0.2019)						
V	0.0002	3.5%	0.0915	0.0900	0.0893	0.7%	98.2%	19.6	19.0	20.0	97.9%
Zn	0.0083	24.6%	0.0915	0.0965	0.0975	1.1%	96.4%	19.8	19.4	20.0	.99.0%
Zr	0.0008	4.3%		0.0040	0.0044	10.4%					
Bi	1.2029	127.4%		3.2917							
			ERR								

TABLE 7.7: SST Core 3, Segment 5 Acid Leach ICP

Samp Log#:	89-1109b1	89-1109b1	89-1109b2	89-1109b2	89-1109b5	89-1109b5		
Dilution:	1.00	5.00	1.00	5.00	1.00	5.00	DL	QL
Wt% Factor	0.02461	0.12305	0.02468	0.12341	0.02465	0.12323		
ICP Run #	226	211	225	210	222	207		
Weight %	(Wt %)	(Wt %)	%dif	(Wt %)	(Wt %)	%dif	(Wt% *)	(Wt% *)
Ag	<DL	<DL		<DL	<DL		<DL	<DL
Al	(0.0115)	(0.0193)		0.0164	(0.0250)		<DL	<DL
As	<DL	<DL		<DL	<DL		<DL	<DL
B	0.0308	(0.0278)		0.0301	(0.0277)		0.0318	(0.0320)
Ba	0.0014	0.0014	4.7%	0.0013	0.0014	7.6%	(0.0001)	<DL
Be	<DL	<DL		<DL	<DL		<DL	<DL
Ca	0.0657	0.0651	1.0%	0.0649	0.0641	1.2%	0.0162	0.0163
Cd	0.0005	(0.0009)		(0.0004)	(0.0011)		0.0005	(0.0009)
Ce	<DL	<DL		<DL	<DL		<DL	<DL
Co	<DL	<DL		<DL	<DL		<DL	<DL
Cr	0.0811	0.0804	0.9%	0.0918	0.0913	0.6%	(0.0006)	<DL
Cu	0.0018	(0.0025)		0.0018	(0.0025)		<DL	<DL
Dy	<DL	<DL		<DL	<DL		<DL	<DL
Fe	1.8894	1.8932	0.2%	1.8946	1.9045	0.5%	0.0036	0.0036
K	0.0330	<DL		0.0316	<DL		(0.0228)	<DL
La	<DL	<DL		<DL	<DL		<DL	<DL
Li	(0.0004)	<DL		(0.0004)	<DL		0.0007	<DL
Mg	0.0156	0.0156	0.2%	0.0156	0.0155	0.3%	0.0036	0.0029
Mn	0.0048	0.0047	0.8%	0.0060	0.0060	0.1%	(0.0001)	(0.0002)
Mo	<DL	<DL		(0.0008)	(0.0014)		<DL	0.0048
Na	10.4691	10.2143	2.4%	10.4898	10.2536	2.3%	0.0515	<DL
Nd	<DL	<DL		<DL	<DL		<DL	(0.0201)
Ni	(0.0019)	<DL		0.0086	(0.0098)		<DL	<DL
P	1.9787	1.8969	4.1%	2.1026	2.0340	3.3%	<DL	<DL
Pb	0.0302	0.0350	15.8%	0.0298	0.0359	20.3%	<DL	<DL
Re	(0.0005)	<DL		(0.0006)	<DL		<DL	<DL
Rh	<DL	<DL		<DL	<DL		<DL	<DL
Ru	<DL	<DL		<DL	<DL		<DL	<DL
Sb	<DL	<DL		<DL	<DL		<DL	<DL
Se	<DL	<DL		<DL	<DL		<DL	<DL
Si	0.1599	0.1291	19.2%	0.1514	0.1277	15.7%	0.0581	0.0512
Sr	0.0265	0.0261	1.5%	0.0267	0.0263	1.2%	(0.0001)	<DL
Te	<DL	<DL		<DL	<DL		<DL	<DL
Th	<DL	<DL		<DL	<DL		<DL	<DL
Ti	(0.0005)	<DL		(0.0005)	<DL		<DL	<DL
Tl	<DL	<DL		<DL	<DL		<DL	<DL
U	(0.0840)	<DL		(0.0774)	<DL		<DL	<DL
V	<DL	<DL		<DL	<DL		<DL	<DL
Zn	0.0121	0.0146	20.4%	0.0120	0.0147	22.0%	0.0014	0.0034
Zr	<DL	<DL		<DL	<DL		<DL	<DL
Bi	2.3392			2.2562			0.0192	

* Methods blank - average sample weight used to calculate wt%.

TABLE 7.7: SST Core 3, Segment 5 Acid Leach ICP (Cont'd)

		89-1109b3		89-1109b3		<Sample ID>		89-1109b4		89-1109b4	
		1.00		5.00		<Dilution>		1.00		5.00	
89-1109b1		Spike Added	Spike+ Sample	Spike+ Sample	Spike Control	Spike Control	Spike STD				
		(Wt %)	(Wt %)	(Wt %)	(Wt %)	% Dif	% Rec	(ug/mL)	(ug/mL)	% Dif	(ug/mL)
Ag	N/A			<DL	<DL						
Al	0.0140	34.8%		0.0143	(0.0219)						
As	N/A		0.3776	0.3550	0.3509	1.2%	94.0%	76.3	76.3	0.0%	80.0
B	0.0305	2.1%		0.0359	(0.0344)						
Ba	0.0014	2.4%	0.3776	0.3720	0.3657	1.7%	98.1%	79.8	78.3	1.9%	80.0
Be	N/A		0.0094	0.0092	0.0093	0.5%	97.9%	2.0	2.0	0.7%	2.0
Ca	0.0653	1.3%		0.0577	0.0569	1.4%					
Cd	0.0004	8.5%	0.0094	0.0151	0.0159	5.7%	154.8%	3.3	3.4	3.3%	2.0
Ce	N/A			<DL	<DL						
Co	N/A		0.0944	0.0899	0.0984	9.5%	95.2%	20.0	20.0	0.3%	20.0
Cr	0.0865	12.4%	0.0378	0.1142	0.1134	0.7%	73.4%	8.2	8.0	1.5%	8.0
Cu	0.0018	0.3%	0.0472	0.0483	0.0486	0.8%	98.5%	10.3	10.2	0.7%	10.0
Dy	N/A			<DL	<DL						
Fe	1.8920	0.3%		1.7963	1.8107	0.8%					
K	0.0323	4.5%		0.0315	<DL						
La	N/A			<DL	<DL						
Li	0.0004	2.7%		(0.0004)	<DL						
Mg	0.0156	0.1%		0.0151	0.0150	0.2%					
Mn	0.0054	22.0%	0.0944	0.0965	0.0954	1.1%	96.6%	20.0	19.5	2.3%	20.0
Mo	N/A			<DL	<DL						
Na	10.4795	0.2%		10.1442	9.9040	2.4%					
Nd	N/A			<DL	<DL						
Ni	0.0052	128.3%	0.0944	0.0955	0.0973	1.9%	95.6%	20.6	20.5	0.3%	20.0
P	2.0407	6.1%		2.0085	1.9365	3.6%					
Pb	0.0300	1.4%	0.0944	0.1238	0.1262	2.0%	99.3%	19.6	19.9	1.2%	20.0
Re	0.0006	6.0%		(0.0005)	<DL						
Rh	N/A			<DL	<DL						
Ru	N/A			<DL	<DL						
Sb	N/A		0.0944	0.0817	(0.0661)						
Se	N/A		0.3776	0.3211	0.3232	0.6%	85.1%	17.0	15.8	7.5%	20.0
Si	0.1557	5.5%		0.4309	0.3390	21.3%					
Sr	0.0266	0.6%		0.0250	0.0247	1.4%					
Te	N/A			<DL	<DL						
Th	N/A			<DL	<DL						
Ti	0.0005	10.3%		(0.0004)	<DL						
Tl	N/A		0.3776	0.2917	<DL						
U	0.0807	8.1%		(0.0601)	<DL						
V	N/A		0.0944	0.0926	0.0919	0.8%	98.1%	19.9	19.6	1.6%	20.0
Zn	0.0121	0.5%	0.0944	0.1032	0.1074	4.1%	96.5%	20.1	20.7	3.0%	20.0
Zr	N/A			(0.0034)	<DL						
Bi	2.2977	3.6%		2.2942							

TABLE 7.8: SST Core 3, Composite 1 Acid Leach ICP

Samp Log#:	89-0977a1	89-0977a1	89-0977a2	89-0977a2	89-0977a5	89-0977a5				
Dilution:	1.00	5.00	1.00	5.00	1.00	5.00	DL	QL		
Wt% Factor	0.02468	0.12341	0.02378	0.11888	0.02422	0.12110				
ICP Run #	156	149	155	148	152	145	DL	QL		
(Wt %)	(Wt %)	%dif	(Wt %)	(Wt %)	%dif	(Wt % *)	(ug/mL)	(ug/mL)		
Ag 0.0007	(0.0008)		0.0013	(0.0008)	<DL	<DL	0.0045	0.0150		
Al 0.0752	0.0735	2.2%	0.0761	0.0720	5.5%	<DL	<DL	0.0542	0.1806	
As <DL	<DL		<DL	<DL		<DL	0.0551	0.1838		
B (0.0030)	<DL		(0.0043)	<DL		(0.0036)	<DL	0.1188	0.3960	
Ba 0.0014	0.0014	1.0%	0.0014	0.0013	5.9%	0.0001	<DL	0.0006	0.0019	
Be <DL	<DL		<DL	<DL		<DL	<DL	0.0001	0.0004	
Ca 0.1012	0.1013	0.1%	0.0968	0.0964	0.3%	0.0157	0.0183	16.7%	0.0115	0.0383
Cd 0.0003	(0.0003)		0.0004	<DL		<DL	<DL	0.0016	0.0055	
Ce <DL	<DL		<DL	<DL		<DL	<DL	0.0770	0.2568	
Co <DL	<DL		<DL	<DL		<DL	<DL	0.1225	0.4082	
Cr 0.0835	0.0830	0.6%	0.0836	0.0823	1.6%	<DL	<DL	0.0076	0.0253	
Cu 0.0067	0.0068	2.2%	0.0093	0.0090	2.7%	0.0022	(0.0018)	0.0053	0.0177	
Dy <DL	<DL		<DL	<DL		<DL	<DL	0.0048	0.0160	
Fe 1.8697	1.8737	0.2%	1.8723	1.8647	0.4%	0.0014	0.0013	6.5%	0.0027	0.0090
K 0.0253	(0.0414)		0.0302	(0.0366)		<DL	<DL	0.1443	0.4810	
La 0.0016	(0.0017)		0.0018	(0.0015)		<DL	<DL	0.0062	0.0207	
Li <DL	<DL		<DL	<DL		<DL	<DL	0.0076	0.0252	
Mg 0.0173	0.0177	2.5%	0.0175	0.0178	1.7%	0.0036	0.0042	16.6%	0.0093	0.0310
Mn 0.0055	0.0056	0.3%	0.0056	0.0055	1.2%	<DL	<DL	0.0018	0.0061	
Mo (0.0018)	<DL		(0.0019)	<DL		<DL	<DL	0.0650	0.2168	
Na 9.5203	9.4432	0.8%	9.4618	9.3633	1.0%	0.0111	<DL	0.1139	0.3798	
Nd <DL	<DL		<DL	<DL		<DL	<DL	0.0338	0.1125	
Ni 0.0019	0.0021	12.4%	0.0021	(0.0017)		<DL	<DL	0.0045	0.0151	
P 1.7332	1.7251	0.5%	1.7767	1.7194	3.2%	<DL	<DL	0.7040	2.3465	
Pb 0.0371	0.0368	0.7%	0.0373	0.0347	7.2%	<DL	<DL	0.0220	0.0733	
Re 0.0005	<DL		0.0006	<DL		<DL	<DL	0.0051	0.0170	
Rh <DL	<DL		<DL	<DL		<DL	<DL	0.0572	0.1907	
Ru <DL	<DL		<DL	<DL		<DL	<DL	0.0174	0.0581	
Sb (0.0074)	<DL		<DL	<DL		(0.0090)	<DL	0.2325	0.7749	
Se <DL	<DL		<DL	<DL		<DL	<DL	0.1211	0.4036	
Si 0.0892	0.0755	15.3%	0.0965	0.0858	11.1%	0.0103	0.0078	24.4%	0.0177	0.0591
Sr 0.0269	0.0264	1.9%	0.0268	0.0261	2.3%	(0.0000)	<DL	0.0006	0.0021	
Te <DL	<DL		(0.0017)	<DL		<DL	<DL	0.0543	0.1810	
Th <DL	<DL		<DL	<DL		<DL	<DL	0.0500	0.1665	
Ti 0.0007	(0.0010)		0.0007	(0.0008)		(0.0002)	<DL	0.0030	0.0100	
Tl <DL	<DL		<DL	<DL		<DL	<DL	2.6620	8.8733	
U 0.0818	(0.0968)		0.0981	<DL		<DL	<DL	0.6774	2.2579	
V <DL	<DL		(0.0001)	<DL		<DL	<DL	0.0033	0.0110	
Zn 0.0076	0.0078	2.3%	0.0076	0.0079	3.3%	(0.0003)	<DL	0.0061	0.0203	
Zr 0.0005	(0.0006)		0.0005	<DL		<DL	<DL	0.0042	0.0139	
Bi 2.4495			1.9307			<DL				

* Methods blank - average sample weight used to calculate wt%.

TABLE 7.8: SST Core 3, Composite 1 Acid Leach ICP (Cont'd)

		89-0977a3		89-0977a3		<Sample ID>		89-0977a4		89-0977a4				
		1.00		5.00		<Dilution>		1.00		5.00				
89-0977a1		Spike	Average	Added	Spike+	Sample	Spike+	Sample	Spike	Control	Spike	Control	Spike	STD
		(Wt %)	RPD	(Wt %)	(Wt %)	(Wt %)	(Wt %)	(Wt %)	% Dif	% Rec	(ug/mL)	(ug/mL)	% Dif	(ug/mL) % rec
Ag	0.0010	58.7%			0.0016	(0.0016)								
Al	0.0756	1.3%			0.0786	0.0767	2.5%							
As	N/A			0.0391	0.0372	0.0386	3.9%	94.9%						
B	0.0036	36.6%			(0.0033)	<DL								
Ba	0.0014	1.3%		0.0391	0.0407	0.0400	1.8%	100.5%						
Be	N/A			0.0010	0.0010	0.0010	1.3%	100.7%						
Ca	0.0990	4.5%			0.1062	0.1066	0.3%							
Cd	0.0003	19.5%		0.0010	0.0020	0.0020	2.8%	167.5%						
Ce	N/A				<DL	<DL								
Co	N/A			0.0098	(0.0093)	<DL								
Cr	0.0836	0.2%		0.0039	0.0907	0.0898	1.0%	183.0%						
Cu	0.0080	32.8%		0.0049	0.0134	0.0135	1.0%	110.4%						
Dy	N/A				<DL	<DL								
Fe	1.8710	0.1%			1.9770	1.9738	0.2%							
K	0.0277	17.7%			0.0306	(0.0479)								
La	0.0017	11.7%			0.0018	(0.0022)								
Li	N/A				<DL	<DL								
Mg	0.0174	1.1%			0.0178	0.0182	1.8%							
Mn	0.0056	0.1%		0.0098	0.0158	0.0157	0.7%	105.0%						
Mo	0.0018	5.4%			(0.0019)	<DL								
Na	9.4911	0.6%			9.7496	9.6502	1.0%							
Nd	N/A				<DL	<DL								
Ni	0.0020	8.4%		0.0098	0.0122	0.0122	0.6%	104.2%						
P	1.7550	2.5%			1.8221	1.8028	1.1%							
Pb	0.0372	0.7%		0.0098	0.0503	0.0505	0.3%	133.8%						
Re	0.0006	16.4%			0.0006	(0.0007)								
Rh	N/A				<DL	<DL								
Ru	N/A				<DL	<DL								
Sb	N/A			0.0098	(0.0105)	<DL								
Se	N/A			0.0391	0.0352	(0.0338)								
Si	0.0928	7.9%			0.1105	0.1031	6.7%							
Sr	0.0268	0.7%			0.0278	0.0271	2.2%							
Te	N/A				(0.0020)	<DL								
Th	N/A				<DL	<DL								
Ti	0.0007	2.4%			0.0007	(0.0009)								
Tl	N/A			0.0391	<DL	<DL								
U	0.0900	18.0%			0.1030	(0.1296)								
V	N/A			0.0098	0.0099	0.0099	0.5%	101.6%						
Zn	0.0076	0.1%		0.0098	0.0181	0.0184	1.9%	106.5%						
Zr	0.0005	10.8%			0.0006	(0.0007)								
Bi	2.1901	23.7%			2.4881									

Inorganic Water Leach ICP Results

A Core Composite sample was leached with deionized water (PNL-ALO-103), filtered, and distributed for analyses including analysis by ICP spectroscopy (PNL-SP-7). The sample preparation was completed in duplicate and included a Methods Blank. Core 3 Composite 1 Water Leach ICP data are reported in Table 7.9. With the exception of detection limits (DL) and quantitation limits (QL), all data are reported in units of weight percent (Wt %) wet sample. If concentrations fall below the estimated DL then "< DL" will be listed. If the value falls between the DL and QL the the value will be reported in parentheses. Detection limits were estimated to be three times the standard deviation of the background. Quantitation limits were estimated as ten times the standard deviation of the background.

Column 1 of Table 7.9 lists the atomic symbols of the 41 elements for which data are reported. Columns 2 and 3 tabulate the results for the analyses of the duplicate samples, and column 4 reports results for the Methods Blank. Columns 5 and 6 list DL and QL values, respectively, in units of micrograms per milliliter ($\mu\text{g}/\text{ml}$). The DL or QL in Wt % can be calculated for any element by multiplying the listed DL or QL (in $\mu\text{g}/\text{ml}$) by the appropriate Wt % Factor in row 3. Column 7 tabulates the average value for the duplicate analyses and Column 8 reports the relative percent difference (RPD).

TABLE 7.9: SST Core 3, Composite 1 Water Leach ICP

Samp Log#:	89-0977c1	89-0977c2	89-0977c5				
Dilution:	10.00	10.00	1.00	DL	QL	89-0977c1 89-0977c2 Average	RPD
Wt% Factor	0.09932	0.09083	0.00934				
ICP Run #	1981	1982	1980				
Ag	(Wt %) (0.0016)	(Wt %) (0.0012)	(Wt % *)	(ug/mL)	(ug/mL)	(Wt %)	RPD
Al	<DL	<DL	<DL	0.0061	0.0204	0.0014	31.0%
As	<DL	<DL	<DL	0.1086	0.3621	N/A	
B	<DL	<DL	<DL	0.0875	0.2918	N/A	
Ba	<DL	<DL	<DL	0.1177	0.3925	N/A	
Be	<DL	<DL	<DL	0.0017	0.0057	N/A	
Ca	0.0040	0.0035	0.0002	0.0021	0.0071	0.0037	13.7%
Cd	0.0028	0.0022	<DL	0.0054	0.0179	0.0025	27.1%
Ce	<DL	<DL	<DL	0.0836	0.2786	N/A	
Co	<DL	<DL	<DL	0.1240	0.4133	N/A	
Cr	0.0071	0.0071	<DL	0.0061	0.0203	0.0071	0.8%
Cu	0.0090	0.0061	<DL	0.0081	0.0271	0.0076	37.6%
Dy	<DL	<DL	<DL	0.0073	0.0245	N/A	
Fe	0.0064	0.0055	<DL	0.0064	0.0214	0.0059	14.5%
K	(0.0850)	(0.0698)	<DL	0.3209	1.0697	0.0774	19.6%
La	<DL	<DL	<DL	0.0096	0.0321	N/A	
Li	0.0039	0.0035	<DL	0.0076	0.0254	0.0037	11.5%
Mg	<DL	<DL	<DL	0.0019	0.0063	N/A	
Mn	<DL	<DL	<DL	0.0019	0.0065	N/A	
Mo	<DL	<DL	<DL	0.1242	0.4141	N/A	
Na	8.4658	8.4186	<DL	0.1390	0.4633	8.4422	0.6%
Nd	<DL	<DL	(0.0005)	0.0294	0.0980	N/A	
Ni	<DL	<DL	<DL	0.0112	0.0373	N/A	
P	0.7773	0.7510	<DL	0.7780	2.5933	0.7641	3.4%
Pb	<DL	<DL	<DL	0.0199	0.0662	N/A	
Re	<DL	<DL	<DL	0.0129	0.0430	N/A	
Rh	<DL	<DL	<DL	0.0547	0.1822	N/A	
Ru	<DL	<DL	<DL	0.0214	0.0712	N/A	
Sb	<DL	<DL	<DL	0.2086	0.6954	N/A	
Se	<DL	<DL	<DL	0.0750	0.2501	N/A	
Si	0.0444	0.0403	<DL	0.0263	0.0878	0.0424	9.7%
Sr	0.0001	(0.0000)	(0.0000)	0.0001	0.0005	0.0000	28.4%
Te	<DL	<DL	<DL	0.0753	0.2510	N/A	
Th	<DL	<DL	<DL	0.0755	0.2517	N/A	
Ti	<DL	<DL	<DL	0.0041	0.0136	N/A	
Tl	<DL	<DL	<DL	1.0297	3.4322	N/A	
U	<DL	<DL	<DL	0.6665	2.2216	N/A	
V	<DL	<DL	<DL	0.0026	0.0088	N/A	
Zn	0.0088	0.0073	<DL	0.0028	0.0093	0.0081	19.4%
Zr	<DL	<DL	<DL	0.0069	0.0229	N/A	
Bi	<DL	<DL				N/A	

* Methods blank - average sample weight used to calculate wt%.

Inorganic Water Leach Anion Analysis Results

An aliquot of the Water Leach sample preparation solution (PNL-AL0-102) is analyzed for anions by ion chromatography (7-40.8) and total carbon/total inorganic carbon (7-40.7). Each sample is prepared in duplicate. In addition, an anion spike is added to a third sample. A Spike Control sample is prepared by adding the same spiking solution to deionized water. Finally, each suite of analyses include a Methods Blank.

The Core 3 Data Package contains anion analysis data for Segment 3 (Table 8.1), Segment 5 (Table 8.2), and Core Composite 1 (Table 8.3). Column 1 of each of these tables list the anions for which data are reported. Columns 2 and 3 tabulate the analytical results for the analyses of the duplicate samples and column 4 lists the relative percent difference (RPD) between the samples. Column 5 lists the "as prepared" concentrations of the anion spiking solution and column 6 lists the "measured" concentrations that are derived from the Spike Control analysis data. Column 7 lists the calculated value of the "spike" added to the spiked sample. Column 8 reports the results from the spiked sample analysis. Percent recoveries (% Spk Rec) are listed in column 9. Estimated method detection limits are shown in column 10.

A comparison of data in columns 5 for the "as prepared" anion spike concentration with the measured concentrations in column 6 indicates that some of the nitrite in the spiking standard has decomposed to nitrate.

9 1 1 2 3 5 5 0 0 7 4

TABLE 8.1: SST Core 3, Segment 3 Anion Analyses by IC/TOC Data

Sample: 89-1107

	C1 (mg/kg)	C2 (mg/kg)	RPD	True (ug/mL)	C4--> (ug/mL)	C3 Spk (mg/kg)	C3 (mg/kg)	% Spk Rec (b)	C5 (c) (mg/kg)
F	1.70E+03	1.71E+03	0.8%	100	94	4.86E+02	2.43E+03	149.3%	<8.00E+00
C1	1.05E+03	1.04E+03	1.2%	150	114	5.88E+02	1.87E+03	141.7%	<8.00E+01
NO2	1.23E+04	1.32E+04	7.2%	1000	564	2.92E+03	1.65E+04	127.8%	<8.00E+00
NO3	1.50E+05	1.62E+05	7.6%	1500	2115	1.09E+04	1.78E+05	200.3%	<8.00E+01
PO4	2.21E+04	2.42E+04	8.9%	3000	2996	1.55E+04	3.90E+04	102.2%	<4.00E+01
SO4	1.02E+04	1.08E+04	5.4%	500	499	2.58E+03	1.36E+04	120.1%	8.23E+01
TIC	8.64E+02	9.36E+02	8.0%						<1.00E+02
TOC	4.95E+02	4.38E+02	12.2%						1.08E+02

- (a) The spike's measured concentration has been used to calculate the quantity of spike added in mg/kg.
- (b) The % spike recovery is valid only if the spike level is over 20% of the sample's base value.
- (c) The average Wt-gm of Sample 1 & 2 is used to calculate blank in mg/kg.

9 1 1 2 3 5 5 0 0 7 5

TABLE 8.2: SST Core 3, Segment 5, Anion Analyses by IC/TOC Data

Sample: 89-1109

-----Spike*Control--(a)--

	C1 (mg/kg)	C2 (mg/kg)	RPD	True (ug/mL)	C4---> (ug/mL)	C3 Spk (mg/kg)	C3 (mg/kg)	% Spk Rec (b)	C5 (c) (mg/kg)
F	2.94E+03	2.23E+03	27.8%	100	88	4.42E+02	3.04E+03	103.3%	<8.00E+00
C1	1.01E+03	1.11E+03	9.3%	150	118	5.89E+02	1.80E+03	125.2%	<8.00E+01
NO2	3.05E+03	3.47E+03	12.9%	1000	517	2.59E+03	5.99E+03	105.7%	<8.00E+00
NO3	1.47E+05	1.75E+05	17.5%	1500	2076	1.04E+04	1.83E+05	217.4%	<8.00E+01
PO4	3.79E+04	3.29E+04	14.0%	3000	2977	1.49E+04	4.81E+04	85.1%	<4.00E+01
SO4	1.02E+04	1.11E+04	8.4%	500	494	2.47E+03	1.32E+04	103.6%	<8.00E+01
TIC	8.79E+02	6.42E+02	31.2%						<1.00E+02
TOC	2.71E+02	2.17E+02	22.0%						1.18E+02

- 50
- (a) The spike's measured concentration has been used to calculate the quantity of spike added in mg/kg.
 - (b) The % spike recovery is valid only if the spike level is over 20% of the sample's base value.
 - (c) The average Wt-gm of Sample 1 & 2 is used to calculate blank in mg/kg.

TABLE 8.3: SST Core 3, Composite 1, Anion Analyses by IC/TOC Data

Sample: 89-0977 File: IC0977

-----Spike*Control--(a)--

	C1 (mg/kg)	C2 (mg/kg)	RPD	True (ug/mL)	C4---> (ug/mL)	C3 Spk (mg/kg)	C3 (mg/kg)	% Spk Rec (b)	C5 (c) (mg/kg)
F	1.59E+03	1.36E+03	15.4%	100	93	4.10E+02	2.05E+03	140.0%	<8.00E+00
C1	1.05E+03	1.05E+03	0.1%	150	118	5.21E+02	1.88E+03	158.5%	<8.00E+01
NO2	9.24E+03	9.17E+03	0.7%	1000	576	2.54E+03	1.17E+04	98.4%	<8.00E+00
NO3	1.63E+05	1.62E+05	0.8%	1500	2095	9.22E+03	1.70E+05	78.1%	<8.00E+01
PO4	2.36E+04	2.18E+04	8.1%	3000	2386	1.05E+04	3.41E+04	108.1%	<4.00E+01
SO4	1.01E+04	1.03E+04	1.3%	500	495	2.18E+03	1.43E+04	190.6%	<8.00E+01
TIC	9.93E+02	9.45E+02	5.0%						<1.00E+02
TOC	3.58E+02	3.00E+02	17.6%						1.03E+02

(a) The spike's measured concentration has been used to calculate the quantity of spike added in mg/kg.

(b) The % spike recovery is valid only if the spike level is over 20% of the sample's base value.

(c) The average Wt-gm of Sample 1 & 2 is used to calculate blank in mg/kg.

Other Inorganic Results

Graphite furnace atomic absorption spectroscopy analyses were performed on samples prepared by the acid leach method (PNL-ALO-101). This procedure leads to significant sample dilutions and this is reflected in the reported detection limits.

The colorimetric chromium(VI) and ammonia are completed on aliquots of the water leach sample.

Mercury analyses sample preparation follows the protocols outlined in the EPA-CLP statement of work. The analyses are completed in duplicate, a third sample split is spiked with mercury and a forth sample is prepared by spiking the mercury standard into deionized water. Finally, a methods blank is run.

Table 9 contains the additional results for the Core 3 composite sample.

No cyanide data are available at this time.

TABLE 9: SST Core 3, Composite 1, Other Inorganic Analyses
Sample Number 89-0977

Graphite-Furnace Atomic Absorption Results

Element	Sample B-1 mg/kg	Sample B-2 mg/kg	Calc. Spike Added mg/kg	Sample B-3 with Spike mg/kg	Spike Control B-4 Calculated ml/l	Measured ml/l	Methods Blank- B-5 mg/kg
As	< 21	< 24					< 2.5
Se	< 21	< 24	"				< 2.5

Colorimetric Cr(VI) Analysis Results*

Sample C-1	Sample C-2	Methods Blank C-5
31.6 mg/kg	25.6 mg/kg	< 20 mg/kg

* Cr(VI) results may be unreliable. Subsequent work has indicated that sample matrix effects cause a positive bias.

Ammonia Analysis Results

Sample C-1	Sample C-2	Methods Blank C-5
314.6 mg/kg	323.4 mg/kg	6.1 mg/kg

Mercury Analysis Results

Sample D-1 mg/kg	Sample D-2 mg/kg	Calc. Spike Added mg/kg	Sample D-3 with Spike mg/kg	Spike Control D-4 Calculated ml/l	Measured ml/l	Methods Blank- D-5 mg/kg
1.0000	0.8290	0.2410	1.2300	0.0500	0.0510	< 0.015

Cyanide Analysis Results

Not available at this time.

RADIOCHEMICAL DATA TABLES

Radiochemical Results

Radiochemical analyses are completed on selected segment and core composite samples. The solution resulting from the potassium hydroxide (KOH) fusion (PNL-ALO-102) are split between the inorganic and radiochemistry groups. Radiochemical analyses completed on this solution include Gamma Energy Analysis (GEA), Total Alpha, Total Beta, and Total Uranium. These radiochemical analyses are also completed for the Water Leach sample (PNL-ALO-103). GEA and uranium data are reported in Table 10. The rest of the radiochemistry results are reported in Table 11.

Plutonium and uranium isotopic analyses are unavailable because their levels in water leach and KOH fusions samples are too low for existing radiochemistry procedures within the 325 Building.

9 1 1 2 0 5 5 0 0 5 1

TABLE 10: SST Core 3 Gamma Energy Analysis Data

Customer No.	-----	-----	-----	-----	-----	-----	-----	-----	Additional Nuclides		
	Cs-137 uCi/g-wet 662 keV	+/- % error	Eu-155 uCi/g-wet 105 keV	+/- % error	Eu-154 uCi/g-wet 1274 keV	+/- % error	Nuclide	Energy keV	uCi/g-wet	+/- % error	
SEGMENT3											
89-0668-A-2	14.07	4.2	0.1930	6.4	0.1114	4.63	Am-241	59.54	0.07209	11	
89-0668-B-2	14.24	4.2	0.2099	6.3	0.1274	4.49	Am-241	59.54	0.07811	11	
89-0669-A-2	14.42	0.2	0.1674	6.2	0.1145	4.27	Am-241	59.54	0.07828	9	
89-0669-B-2	14.62	4.3	0.1965	6.3	0.1055	4.77	Am-241	59.54	0.07638	11	
SEGMENT5											
89-1109-A-1	10.66	0.2			0.0076	19	Co-60 Gd-153	1332.5 97.43	0.000837 0.02186	59 19	
89-1109-A-2	10.31	0.2			0.0060	26.5	Co-60 Gd-153	1332.5 97.43	0.000898 0.01951	51 21	
89-1109-A-3*	0.0165	2.3			0.0006	71.2	Am-241	59.54	0.000382	39	

* Methods Blank

9 1 1 2 0 5 - 5 0 0 5 2

TABLE 10: SST Core 3 Gamma Energy Analysis Data (Cont'd)

Customer No.	Cs-137 uCi/g-wet 662 keV	+/- % error	Eu-155 uCi/g-wet 105 keV	+/- % error	Eu-154 uCi/g-wet 1274 keV	+/- % error	Nuclide	Additional Nuclides		
								Energy keV	uCi/g-wet	+/- % error
COMPOSITE - 1										
89-0971-A-2	14.63	0.2	0.0938	9.8	0.0476	7.18	Am-241	59.54	0.03789	14
							Co-60	1332.5	0.002987	22
89-0971-B-2	13.12	0.2	0.0653	12.2	0.0476	7.48	Am-241	59.54	0.03990	13
							Co-60	1332.5	0.001292	35
							Cs-134	604.71	0.005162	46
89-0972-A-2	13.92	0.2	0.0703	11.8	0.0501	6.26	Am-241	59.54	0.03701	13
							Co-60	1332.5	0.001904	24
89-0972-B-2	14.11	0.2	0.0675	11.9	0.0493	7.1	Am-241	59.54	0.02831	18
							Co-60	1332.5	0.002916	17
COMPOSITE - 2										
89-0973-A-2	13.43	0.2	0.0633	12.2	0.0489	6.93	Am-241	59.54	0.03445	14
							Co-60	1332.5	0.003856	14
							Se-75	264.66	0.03453	13
89-0973-B-2	13.58	0.2			0.05051	7.75	Am-241	59.54	0.04144	14
89-0974-A-2	13.68	0.2	0.08577	10.5	0.06017	6.34	Am-241	59.54	0.04068	15
							Co-60	1332.5	0.006878	13
							Gd-153	97.43	0.01493	32
							Cs-134	604.71	0.01438	20

TABLE 10: SST Core 3 Gamma Energy Analysis Data (Cont'd)

Customer No.	Cs-137 uCi/g-wet 662 keV	+/- % error	Eu-155 uCi/g-wet 105 keV	+/- % error	Eu-154 uCi/g-wet 1274 keV	+/- % error	Additional Nuclides				
							Nuclide	Energy keV	uCi/g-wet	+/- % error	
COMPOSITE - 2 (Cont.)											
89-0974-B-2	13.58	0.2	0.0846	10.5	0.0601	6.45	Am-241	59.54	0.03568	14	
							Co-60	1332.5	0.09852	3	
							Cs-134	604.71	0.008589	29	
							Ce-144	133.54	0.02944	45	
COMPOSITE - 3											
89-0975-A-2	13.05	0.2	0.0779	10.8	0.0416	7.13	Am-241	59.54	0.03421	14	
58	89-0975-B-2	13.11	0.2	0.0603	11.1	0.0440	7.71	Am-241	59.54	0.02888	19
								Co-60	1332.5	0.002291	22
								Gd-153	97.43	0.01301	40
89-0976-A-2	14.13	0.2	0.0785	11.3	0.0446	7.07	Am-241	59.54	0.03239	15	
							Co-60	1332.5	0.001279	35	
89-0976-B-2	14.17	0.1	0.0606	4.6	0.0448	2.69	Am-241	59.54	0.03654	6	
							Co-60	1332.5	0.02236	2	
							Cs-134	604.71	0.002746	31	
							Ce-144	133.54	0.01274	36	
							Gd-153	97.43	0.008755	22	
							Ru-106	511.86	0.02308	28	

9 1 1 2 7 5 - 5 0 0 3 4

TABLE 10: SST Core 3 Gamma Energy Analysis Data (Cont'd)

Customer No.	Cs-137 uCi/g-wet 662 keV	+/- % error	Eu-155 uCi/g-wet 105 keV	+/- % error	Eu-154 uCi/g-wet 1274 keV	+/- % error	Additional Nuclides		
							Nuclide	Energy keV	uCi/g-wet +/- % error
89-0977-C-1	7.5760	0.1							
89-0977-C-2	7.652	0.1							
89-0977-C-3									
89-0977-C-5*	0.0019	4.1					Cs-134	604.71	0.000054
									32

* Methods Blank

9 1 1 2 2 5 - 5 0 0 3 5

TABLE 11: SST Core 3 Radiochemistry Data

TOTAL ALPHA, TOTAL BETA AND URANIUM

Customer No.	Tot alpha dpm/g	+/- % error*	Tot beta (dpm/g) @Sr90-Y90	+/- % error	Uranium ug/g wet wt.	+/- % error
Core 3 - Segment 3						
89-0668-A-2	5.49E+05	2.8	3.16E+08	3.3	163	11.0
89-0668-B-2	4.94E+05	2.8	3.24E+08	3.4	173	11.2
89-0669-A-2	5.01E+05	2.8	3.03E+08	3.3	163	10.4
89-0669-B-2	4.96E+05	2.8	3.09E+08	3.3	163	10.4
Core 3 - Segment 5						
89-1109-A-1	1.77E+05	2.9	3.09E+07	3.6	48	8.9
89-1109-A-2	1.89E+05	2.9	2.96E+07	3.6	41	10.3
89-1109-A-3**	2.81E+03	14.5	1.67E+05	3.5	1	36.0
Core 3 Composite						
89-0971-A-2	2.84E+05	2.8	1.31E+08	3.6	180	7.0
89-0971-B-2	3.24E+05	2.8	1.40E+08	3.6	175	7.3
89-0972-A-2	3.18E+05	2.8	1.46E+08	3.6	180	6.7
89-0972-B-2	3.23E+05	2.8	1.50E+08	3.6	181	7.0
Composite water Leach						
89-0977-C-1	4.37E+03	4.7	1.67E+07	3.7	1	10.0
89-0977-C-2	3.22E+03	4.9	1.64E+07	3.7	1	9.0
89-0977-C-5**	<5 E+02 det lim		9.90E+03	6.3	0.10	38.0

* Total alpha values may be low because of loss of Pu, Am and Np during sample preparation.

Because of this there may be an additional 30% uncertainty in the data.

** Methods Blank

TABLE 11: SST Core 3 Radiochemistry Data (Cont'd)

Sr-90, Tc-99 and I-129 DATA

Customer No.	Sr-90 dpm/g	+/- % error	Tc-99 dpm/g	+/- % error	I-129 dpm/g	+/- % error
Core Composite						
89-0971-A-2 rerun	6.08E+07	5.4	1.99E+04 *		<33	
			2.15E+04 *			
89-0971-B-2 rerun	5.86E+07	6.1	7.41E+03 *		<34	
			2.02E+04 *			
89-0972-A-2 rerun	5.80E+07	6.0	1.70E+04 *		<14	
			1.12E+04 *			
89-0972-B-2 rerun	5.74E+07	6.0	1.41E+04 *		<32	
			1.18E+04 *			
Comp. Water Leach						
89-0977-C-1	1.93E+05	7.0	NA		NA	
89-0977-C-2	1.68E+05	7.0	NA		NA	
89-0977-C-3	NA		3.55E+04	5.8	<17	

* The Tc values may be low because of potential loss of Tc during sample preparation.

H-3 and C-14 DATA

Customer No.	H-3 dpm/g	+/- % error	C-14 dpm/g	+/- % error
Comp. Water Leach				
89-0977-C-1	<5 E+03		<8 E+03	
89-0977-C-2	<5 E+03			

TABLE 11: SST Core 3 Radiochemistry Data (Cont'd)

ALPHA ENERGY ANALYSIS OF Pu and Np

Customer No.	Pu 239&240		Pu 238 dpm/g	+/- % error	Np 237 dpm/g	+/- % error
	dpm/g	+/- % error				
Core 3 Composite						
89-0971-A-2	3.12E+05	5.8	4.9E+03	7	1.90E+02	22.00
89-0971-B-2	3.51E+05	5.8	7.4E+03	9	1.60E+02	20.00
89-0972-A-2	2.43E+05	6.0	3.6E+03	10	2.50E+02	22.00
89-0972-B-2	3.08E+05	5.7	4.5E+03	10	1.10E+02	35.00
Comp. Water Leach						
89-0977-C-1	4.60E+03	7.2	6.7E+01	26	9(est max)*	
89-0977-C-2	3.90E+03	7.4	6.6E+01	23	32(est max)*	

*Low count rates and Pu-Am contamination prevent calculation of absolute values.

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ALPHA ENERGY ANALYSIS OF Am AND Cm

Customer No.	Am 241 dpm/g	+/- % error	Cm-243&244	
			dpm/g	+/- % error
Core 3 Composite				
89-0971-A-2	4.10E+04	19	1.7E+03	44
89-0971-B-2	4.90E+04	22	---	
89-0972-A-2	5.16E+04	9	8.5E+02	21
rerun	5.16E+04	11	9.0E+02	39
89-0972-B-2	6.90E+04	10	2.6E+03	27
Comp. Water Leach				
89-0977-C-3	4.86E+02	15	5E+00	49
rerun	4.60E+02	8	---	